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DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
MINISTRY OF FOOD AND AGRICULTURE, DEPARTMENT OF
AGRICULTURE, GOVERNMENT OF INDIA

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PLANT PROTECTION BULLETIN

SCIENCE IN PRACTICE

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Pests & Diseases Number
(Issued in 1963)

Issued by the
PLANT PROTECTION ADVISER TO THE GOVERNMENT OF INDIA
NEW DELHI

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NOTE

This Bulletin is intended to disseminate information about plant protection measures and campaigns adopted or conducted in different parts of India as well as about the advances made in the field of plant protection in other parts of the world, to the extent possible. It is also intended to give information about the latest developments in the production of pesticides, plant protection equipment and techniques of pest and plant disease control. Elaborate scientific papers on Entomology or Plant Pathology or on the chemistry of pesticides would normally not be in place in this Bulletin but short notes dealing with the behaviour or distribution of pests and plant diseases and brief notes on their epidemiology, control, etc., would be welcome.

Manuscripts submitted for publication in this Bulletin must be typed in double spacing on one side of the paper only, leaving ample margin on the left, at the bottom and on the top of the page. Photographs or drawings should be reduced to the minimum number possible and must be accompanied by a clearly typed legend which should appear under them. In addition, they should bear on their reverse in clear handwriting in pencil the name or names of the author or authors and the article which they illustrate. While this Directorate will take every care to include only such material in this Bulletin as may be considered reasonably correct and useful, it can accept no responsibility for every statement made and every opinion expressed.

Due to various unavoidable reasons, the appearance of this Bulletin has been far behind the scheduled time. While this must be greatly regretted, every effort would be made to avoid delays in future. Those who may read this Bulletin are invited to offer criticisms and suggestions for its improvement.

SARDAR SINGH

Plant Protection Adviser to the Government of India

PREFACE

A list of pests and diseases of agricultural importance in India was published in a special volume of the *Plant Protection Bulletin,* Vol. 7, Nos. 1—4, 1955. Since the publication of that list, some further information has become available about the occurrence, distribution, economic status and control of several pests and diseases included in the list already or omitted from it. Further, the political re-organisation of States in India and the changes in boundaries that have followed it, have made it necessary to revise the information given earlier about the distribution of various pests and diseases. It is hoped that the revised list, presented herewith, would prove useful to specialists, extension workers, students of agriculture and others engaged or interested in plant protection.

The list is far from being a handbook of plant protection. It only gives the English and scientific names of insects and other pests, diseases and parasitic plants, which may cause damage to crops, fruit trees and stored agricultural commodities in different parts of India. While efforts have been made to give the latest scientific names of the pests and disease organisms as far as possible, the list is obviously not intended to settle any disputed points of scientific nomenclature.

The distribution of the pests and diseases given in the list is also not exhaustive. The list indicates the States or the areas wherein particular pests or diseases have been well known or have acquired notoriety on account of the damage they cause to crops, etc. The economic status of the pests and diseases mentioned in the list is only indicative. Sometimes the same pest or disease may be very serious in some areas of the country and not in others, or in any particular area, it may not generally be serious but may assume great economic importance in certain years. The control measures given in the list are likewise those which have been usually and fairly successfully practised in different States of India. In some cases, where satisfactory control measures are not known, no information about control is given. The use of resistant varieties and rotation with non-susceptible crops have been indicated against some plant diseases. In such cases, detailed information about resistant varieties and the crops to be grown in rotation may be obtained from the local agricultural authorities.

This Directorate would welcome any criticism, comments or suggestions for improvement which specialists and plant protection workers may find it necessary to make and to communicate to us.

SARDAR SINGH
Plant Protection Adviser to the Government of India

New Delhi
March, 1963

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DIRECTORATE OF PLANT PROTECTION, QUARANTINE AND STORAGE

Insects and other Pests of Agricultural Importance in India

Crop	Pest	Distribution	Economic Status	Control Measures*
(1)	(2)	(3)	(4)	(5)
CEREALS Paddy	1. Rice bugs *Leptocorisa acuta* Thun. *L. varicornis* Fb.	All over India	Serious	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
	2. Green jassids *Nephotettix bipunctatus* Fb. *N. apicalis* Mots.	Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Kerala, Maharashtra, Madhya Pradesh, Madras, Mysore, Orissa, Uttar Pradesh, West Bengal.	Serious	1. Spraying with 0·15% DDT @ 60—80 gallons per acre. 2. Dusting with 5% DDT @ 15—20 lb. per acre.
	3. White jassid *Tettigoniella spectra* Dist.	Andhra Pradesh, Kerala, Madras, Mysore.	Serious	Do.
	4. Black bug *Scotinophara lurida* (Burm.)	Madras	Mild	Do.
	5. Mealy bug *Ripersia oryzae* Green	Andhra Pradesh, Assam, Bihar, Madras, Madhya Pradesh, Mysore, Orissa, West Bengal.	Moderate	Spraying with 0·5% BHC or 0·08% malathion or 0·05% parathion @ 60—80 gallons per acre.
	6. Fulgorid bug *Nilaparvata lugens* Stol.	Andhra Pradesh, Bihar, Kerala, Madras, Madhya Pradesh, Mysore, Orissa, Uttar Pradesh.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	7. Rice root aphid *Tetraneura hirsuta* (Baker)	Kerala, Madras, Orissa	Mild	Dipping the seedlings in and spraying the soil around the plant with 0·05% parathion.
	8. Paddy stem borer *Schoenobius incertulas* Wlk.	All over India	Moderate	1. Ploughing up and destroying the stubbles after harvest. 2. Collection and destruction of egg clusters in nursery plants. 3. Dipping seedlings in 0·1% DDT suspension before transplanting. 4. Spraying with 0·025% parathion or 0·03% endrin in the field @ 60—80 gallons per acre.

*The gallonage of spray fluid refers to high volume spraying in each case.

(1)	(2)	(3)	(4)	(5)
CEREALS—*contd.* Paddy—*contd.*	9. Swarming caterpillar *Spodoptera mauritia* Boisd.	All over India except Himachal Pradesh, Jammu & Kashmir, Punjab.	Serious	1. Dusting with 5% BHC or DDT @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT or 0·03% endrin @ 60—80 gallons per acre.
	10. Rice case worm *Nymphula depunctalis* Guen.	All over India except Himachal Pradesh, Jammu & Kashmir.	Serious	1. Dusting with 5% BHC or DDT @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
	11. Army worms *Cirphis unipuncta* Haw. *C. albistigma* M.	Andhra Pradesh, Assam, Kerala, Madras, Manipur, Madhya Pradesh, Mysore, Orissa, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Dusting with 5% BHC or DDT @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
	12. Paddy leaf roller *Cnaphalocrocis medinalis* Guen.	Andhra Pradesh, Kerala, Madras, Maharashtra, Mysore, Orissa, West Bengal.	Moderate	1. Dusting with 10% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
	13. Semi-looper *Psalis securis* Hbn.	Assam, Kerala	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.
	14. Rice borer *Scirpophaga innotata* Wlk.	Kerala, Madras, Orissa	Mild	Spraying with 0·03% endrin @ 60—80 gallons per acre.
	15. Striped rice borer *Chilo suppressalis* Wlk.	Andhra Pradesh, Bihar, Kerala, Madras, Mysore.	Mild	Spraying with 0·03% endrin @ 60—80 gallons per acre.
	16. Pink borer *Sesamia inferens* Wlk.	Andhra Pradesh, Bihar, Madras, Madhya Pradesh, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Mild	1. Spraying with 0·03% endrin @ 60—80 gallons per acre. 2. Dusting with 5% BHC or DDT @ 15—20 lb. per acre.
	17. Paddy skipper *Parnara mathias* Fb.	Andhra Pradesh, Assam, Madras, Maharashtra, Mysore, Orissa, Punjab, West Bengal.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	18. Gall fly *Pachydiplosis oryzae* Wood-Mason	Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Maharashtra, Madhya Pradesh. Madras, Mysore, Orissa, West Bengal.	Serious in Maharashtra; moderate elsewhere	1. Light trapping at the time of sowing for a fortnight. 2. Spraying with 0·25% DDT or 0·02% endrin @ 60—80 gallons per acre.

	19. Rice hispa *Hispa armigera* Oliv. *H. aenescens* Baly.	All over India except Jammu & Kashmir.	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre. 3. Clipping off and destroying the leaf tips in nurseries while transplanting seedlings.
	20. Blue beetle *Leptispa pygmoea* Baly.	Andhra Pradesh, Assam, Kerala, Madras, Maharashtra, Mysore, Orissa.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	21. Root weevil *Echinocnemus oryzae* M.	Andhra Pradesh, Kerala, Madras, Mysore, Orissa, Punjab, Uttar Pradesh.	Serious in Andhra Pradesh, moderate elsewhere.	Mixing 5% BHC dust in the soil before sowing @ 30—40 lb. per acre.
	22. Rice grasshoppers *Hieroglyphus banian* Fb. *H. oryzivorus* Carl. *H. furcifer* Serv.	All over India	Serious	1. Dusting with 5% BHC @ 20—30 lb. per acre. 2. Spraying with 0·02% aldrin @ 60—80 gallons per acre.
	23. Spotted grasshopper *Aularches miliaris* L.	Assam Andhra Pradesh, Madras, Mysore, Orissa, Punjab.	Moderate	Do.
	24. *Phadka* grasshopper *Hieroglyphus nigrorepletus* Bol.	Andhra Pradesh, Bihar, Madras, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Serious	Do.
	25. Surface grasshoppers *Oxya velox* Fb. *O. bidentata* Wlk. *O. multidentata* Wilt. *Aelopus tamulus* Kirby *Acrida exaltata* L. *A. turrita* L.	Andhra Pradesh, Bihar, Himachal Pradesh, Jammu & Kashmir, Madras, Mysore, Orissa, Punjab, Uttar Pradesh.	Moderate	Do.
	26. Paddy eelworm *Ditylenchus angusta* But.	Bihar, Uttar Pradesh	Serious	—
Wheat, Barley & Oats	1. Sunn pest *Eurygaster maura* L.	Himachal Pradesh	Mild	Dusting with 10% BHC @ 15—20 lb. per acre.
	2. Aphis *Rhopalosiphum (Aphis) maidis* Fitch. *Sitobion avenae* Fb.	All over India	Moderate	Spraying with 0·2% BHC or 0·025% parathion @ 60—80 gallons per acre.
	3. Termites *Odontotermes (Cyclotermes) obesus* Ramb. *Microtermes obesi* Holm.	All over the plains of India	Serious	Mixing 5% BHC, aldrin or chlordane dust in the soil @ 20—25 lb. per acre.

(1)	(2)	(3)	(4)	(5)
CEREALS—*contd.* Wheat, Barley & Oats—*contd.*	4. Pink borer *Sesamia inferens* Wlk.	Madhya Pradesh, Maharashtra, Orissa.	Moderate	1. Spraying with 0·03% endrin @ 60—80 gallons per acre. 2. Dusting with 5% BHC or DDT @ 15—20 lb. per acre.
	5. Cutworms *Agrotis ypsilon* Rott. *A. flammatra* Schiff.	Bihar, Himachal Pradesh, Madhya Pradesh, Punjab, Rajasthan.	Moderate	1. Mixing 5% DDT dust in soil before sowing @ 20—25 lb. per acre. 2. Dusting ground around plants with 5% DDT, chlordane, heptachlor or aldrin @ 15—20 lb. per acre. 3. Spraying the base of the plants with 0·03% aldrin @ 60—80 gallons per acre.
	6. Army worm *Cirphis unipuncta* Haw:	Bihar, Punjab, Rajasthan, Uttar Pradesh.		1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
	7. Weevil *Tanymecus indicus* Fst.	Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Mixing 5% BHC or DDT dust in the soil @ 20—30 lb. per acre before sowing. 2. Dusting 5% BHC or DDT at the base of the seedlings and young plants @ 20—30 lb. per acre.
	8. Surface grasshopper *Chrotogonus trachypterus* Blanch.	Madhya Pradesh, Punjab	Moderate	Dusting with 5% BHC @15—20 lb. per acre.
	9. Ear cockle *Anguina tritici* Filip.	Bihar, Delhi, Punjab, Rajasthan, Uttar Pradesh.	Serious	1. Eradicating affected ear-heads. 2. Selecting healthy seeds by floatation method.
Jowar, maize, bajra and lesser millets	1. Jowar earhead bug *Calocoris angustatus* Letch.	Andhra Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	2. Aphis *Rhopalosiphum maidis* Fitch	Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Maharashtra, Orissa, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·2% BHC or 0·025% parathion @ 60—80 gallons per acre.
	3. Shoot bug *Pundaluoya simplicia* Dist.	Andhra Pradesh, Madhya Pradesh, Madras, Mysore.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.

4. Root aphis *Tetraneura hirsuta* Baker	Madras, Mysore	Moderate	Mixing crude oil emulsion with irrigation water.
5. Stem borer *Chilo zonellus* Swinh.	Andhra Pradesh, Assam, Bihar, Delhi, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Pondicherry, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Ploughing up and destruction of stubbles after harvest. 2. Spraying with 0·32% DDT @ 60—80 gallons per acre.
6. Pink borer *Sesamia inferens* Wlk.	Andhra Pradesh, Assam, Bihar, Madras.	Moderate	1. Spraying with 0·03% endrin @ 60—80 gallons per acre. 2. Dusting with 5% BHC or DDT @ 15—20 lb. per acre.
7. Army worm *Cirphis unipuncta* Haw.	Andhra Pradesh, Bihar, Madhya Pradesh, Madras, Maharashtra, Mysore, Rajasthan.	Moderate	1. Dusting with 5% BHC or DDT @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
8. Cutworms *Agrotis ypsilon* Rott. *A. flammatra* Schiff. *Euxoa segetis* Schiff.	Bihar, Delhi, Himachal Pradesh, Madhya Pradesh, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Mixing 5% DDT dust in soil before sowing at 20—25 lb. per acre. 2. Dusting with 5% DDT or heptachlor or chlordane or aldrin near the base of plants @ 15—20 lb. per acre. 3. Spraying the base of the plants with 0·03% aldrin @ 60—80 gallons per acre.
9. Lucerne caterpillar *Laphygma exigua* (Hbn.)	Andhra Pradesh, Madhya Pradesh, Madras, Mysore, Punjab.	Sometimes serious in Andhra Pradesh, moderate elsewhere.	Dusting with 5% BHC @ 15—20 lb. per acre.
10. *Kutra* (Red hairy caterpillars) *Amsacta moorei* Butler *A. albistriga* Wlk.	Andhra Pradesh, Bihar, Delhi, Gujarat, Madhya Pradesh, Madras, Mysore, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Serious	1. Dusting with 10% BHC @ 15—20 lb. per acre. 2. Spraying with 0·5% BHC or 0·03% endrin @ 60—80 gallons per acre. 3. Using light traps against moths.
11. Black hairy caterpillar *Estigmene lactinea* Cram.	Andhra Pradesh, Kerala, Madras, Mysore.	Serious	Do.

(1)	(2)	(3)	(4)	(5)
CEREALS—*contd.* *Jowar*, maize, bajra and lesser millets—*contd.*	12. Leaf roller *Marasmia trapezalis* Guen.	Andhra Pradesh, Madras, Uttar Pradesh.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.
	13. White borer *Saluria inficita* Wlk.	Madras, Mysore, Orissa	Moderate	1. Using light traps to attract moths. 2. Spraying with 0·32% DDT @ 60—80 gallons per acre.
	14. Stem fly *Atherigona indica* M.	Andhra Pradesh, Maharashtra, Punjab.	Moderate	Removal and destruction of affected shoots.
	15. White grubs *Xylotrupes gideon* L. *Lachnosterna longipennis* Blanch. *Anomala polita* Blanch. *A. rugosa* Arrow *A. dimidiata* Hope	Himachal Pradesh, Punjab, Uttar Pradesh.	Moderate	Treating soil with 5% chlordane or aldrin dust @ 30—40 lb. per acre.
	16. Earhead beetles *Gnathospastoides rouxi* C. *Lytta* spp.	Andhra Pradesh, Gujarat, Maharashtra.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.
	17. Rice grasshopper *Hieroglyphus banian* Fb.	Bihar, Madras, Mysore, Orissa, Punjab, Uttar Pradesh.	Moderate	Dusting with 10% BHC @ 15—20 lb. per acre.
	18. Deccan wingless grasshopper *Colemania sphenareoides* Bol.	Andhra Pradesh, Gujarat, Madhya Pradesh, Madras, Maharashtra, Mysore.	Serious	Do.
	19. *Phadka* grasshopper *Hieroglyphus nigrorepletus* Bol.	Andhra Pradesh, Bihar, Delhi, Himachal Pradesh, Madras, Punjab, Rajasthan, Uttar Pradesh.	Serious	Do.
	20. Mite *Oligonychus indicus* (Hirst)	Andhra Pradesh, Delhi, Madhya Pradesh, Madras, Mysore, Orissa, Punjab.	Mild	Spraying with lime sulphur wash (1:2:16) @ 60—80 gallons per acre.
PULSES				
Gram and Peas	1. Pea aphis *Macrosiphum pisi* Kalt.	Andhra Pradesh, Himachal Pradesh, Madras, Orissa, Punjab, Uttar Pradesh, West Bengal.	Mild	Spraying with 0·06% Nicotine sulphate or 0·025% parathion @ 60—80 gallons per acre.
	2. Gram caterpillar *Heliothis armigera* Hbn.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	Dusting with 5% BHC or DDT @ 15—20 lb. per acre.

3. Gram cutworms *Euxoa segetis* Schiff. *Agrotis ypsilon* Rott. *A. flammatra* Schiff. *A. spinifera* Hbn.	Andhra Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Mixing 5% DDT dust in soil before sowing @ 20—25 lb. per acre. 2. Dusting with 5% DDT, heptachlor, chlordane or aldrin at the base of plants @ 15—20 lb. per acre. 3. Spraying the base of the plants with 0·03% aldrin @ 60—80 gallons per acre.
4. *Kutra* (Red hairy caterpillars) *Amsacta moorei* Butler *A. albistriga* Wlk.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Himachal Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Serious	1. Dusting with 10% BH C@ 15—20 lb. per acre. 2. Spraying with 0·5% BHC or 0·03% endrin @ 60—80 gallons per acre. 3. Using light traps against moths.
5. Pea semi-loopers *Plusia orichalcea* Fb. *P. nigrisigna* Wlk.	Assam, Bihar, Madhya Pradesh, Uttar Pradesh.	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·1% DDT @ 60—80 gallons per acre.
6. Bihar hairy caterpillar *Diacrisia obliqua* Wlk.	Assam, Bihar, Mysore, Punjab	Serious in certain years.	1. Dusting with 5% BHC (for young stages) or 10% BHC (for grown-up caterpillars) @ 15—20 lb. per acre. 2. Spraying with 0·25% to 0·5% DDT or BHC or 0·05% parathion @ 60—80 gallons per acre.
7. Plume moth *Exelastis atomosa* Wlsm.	Andhra Pradesh, Assam, Madhya Pradesh, Madras, Maharashtra.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.
8. Pod borers *Etiella zinckenella* Treitsche *Adisura atkinsoni* Moore *Maruca testutalis* Gey.	Andhra Pradesh, Assam, Bihar, Madras, Mysore, Orissa, Punjab, Uttar Pradesh.	Mild	1. Spraying with 0·25% DDT @ 60—80 gallons per acre. 2. Dusting with 5% BHC @ 15—20 lb. per acre.
9. Pea leaf miner *Phytomyza atricornis* Meign.	Bihar, Delhi, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·25% DDT or 0·06% Nicotine sulphate @ 60—80 gallons per acre.

(1)	(2)	(3)	(4)	(5)
PULSES—*contd.* Gram and Peas—*contd.*	10. Pea stem borer *Melanagromyza phaseoli* Coq.	Andhra Pradesh, Assam, Bihar, Madras, Punjab, Uttar Pradesh.	Serious in Assam, mild elsewhere.	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·2% DDT @ 60—80 gallons per acre.
	11. Tur pod fly *Agromyza obtusa* Mall.	Bihar, Delhi, Madhya Pradesh, Maharashtra, Mysore, Orissa, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·25% DDT @ 60—80 gallons per acre.
SUGARCANE	1. Sugarcane leaf hopper *Pyrilla perpusilla* Wlk.	All over India	Serious	1. Dusting with 5% BHC @ 30—40 lb. per acre. 2. Spraying with 0·02% endrin @ 100—150 gallons per acre.
	2. Sugarcane whiteflies *Aleurolobus barodensis* Mask. *Neomaskellia bergii* Sign.	Andhra Pradesh, Bihar, Delhi, Gujarat, Himachal Pradesh, Madhya Pradesh, Madras, Maharashtra, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·25% BHC or 0·05% to 0·1% parathion @ 100—150 gallons per acre.
	3. Sugarcane black bug *Macropes excavatus* Dist.	Bihar, Delhi, Punjab, Uttar Pradesh	Moderate	Spraying with 0·16% DDT or 0·25% BHC @ 100—150 gallons per acre.
	4. Sugarcane scale *Aspidiotus glomeratus* Green	Bihar, Madras	Mild	Spraying with lime sulphur wash (1:2:16) or 0·025% parathion @ 100—150 gallons per acre.
	5. Mealy bugs *Saccharicoccus sacchari* Ckll. *S. saccharifolii* Green *Ripersia sacchari* Green	Andhra Pradesh, Assam, Bihar, Madras, Maharashtra, Mysore, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·025% parathion @ 100—150 gallons per acre.
	6. Sugarcane aphis *Rhopalosiphum maidis* Fitch	Bihar, Madras	Mild	Spraying with 0·2% BHC or 0·05% Nicotine sulphate or 0·025% parathion @ 100—150 gallons per acre.
	7. Termites *Odontotermes assmuthi* Hlmgr. *O. obesus* Ramb. *O. taprobanes* Wlk. *Microtermes obesi* Hlmgr. *Trinervitermes heimi* Wasm. *Eremotermes paradoxalis* Hlmgr.	All over India	Moderate	Dusting furrows with 5% BHC, aldrin or chlordane @ 30—40 lb. per acre.

8. Sugarcane thrips *Fulmekiola saccharicida* Ramak. & Marg.	Bihar, Madras	Moderate	1. Dusting with 5% BHC @ 20—25 lb. per acre. 2. Spraying with 0·16% BHC @ 100—150 gallons per acre.
9. Stem borers *Chilotraea infuscatella* Sn. *Chilo tumidicostalis* Hmps. *Proceras indicus* Kapur *Chilotraea auricilia* Dudg. *Raphimatopus ablutella* Zell.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Pondicherry, Punjab, Rajasthan, Tripura, Uttar Pradesh, West Bengal.	Moderate to Serious.	1. Earthing up of young crop followed by irrigation. 2. Removal of dead heart and killing larvae by means of spike thrust method. 3. Spraying with 0·1% endrin or 0·32% DDT @ 100—150 gallons per acre. 4. Mixing 10% BHC dust in soil @ 50 lb. per acre while planting the setts against early shoot borer.
Bissetia steniellus Hmps.	Punjab, Uttar Pradesh	Serious	1. Ploughing up and destroying the stubbles. 2. Removing infested tops, at least once a week during the season.
10. Pink borer *Sesamia inferens* Wlk.	Bihar, Delhi, Madhya Pradesh, Madras, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Ploughing up and destroying the stubbles after harvest.
11. Root borer *Emmalocera depressella* Swinh.	Bihar, Madhya Pradesh, Madras, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Do.
12. Top borer *Scirpophaga nivella* Fb.	All over India	Serious	Removing and destroying affected shoots.
13. White grubs *Lachnosterna consanguinea* Blanch. *Melolontha* sp.	Bihar, Punjab	Mild	Mixing 5% aldrin dust in the soil @ 40 lb. per acre.
14. Weevil *Tanymecus sciurus* Olivier	Bihar	Mild	Mixing 5% BHC or aldrin dust @ 40 lb. per acre.
15. Sugarcane hispa *Asamangulia cuspidata* Maulik	Bihar, Madras, Punjab, Uttar Pradesh.	Mild	Dusting with 5% BHC @ 20—25 lb. per acre.
16. *Phadka* grasshopper *Hieroglyphus nigrorepletus* Bol.	Bihar, Uttar Pradesh	Moderate	Do.

(1)	(2)	(3)	(4)	(5)
SUGARCANE —*contd.*	17. Rice grasshopper *H. banian* Fb.	Bihar, Maharashtra, Punjab, Uttar Pradesh.	Moderate	Dusting with 5% BHC @ 20—25 lb. per acre.
	18. Sugarcane grasshopper *Choroedocus illustris* Wlk.	Madras, Mysore	Moderate	Do.
	19. Sugarcane mite *Oligonychus indicus* Hirst	Andhra Pradesh, Bihar, Madras, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·25% Aramite or 0·025% parathion or lime sulphur wash (1:2:16) @100—150 gallons per acre.
FIBRE CROPS				
Cotton	1. Cotton jassids *Empoasca devastans* Dist. *E. flavescens* Fb.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Serious	1. Spraying with 0·16% DDT @ 80—100 gallons per acre. 2. Spraying with a mixture of 0·1% DDT and 0·1% BHC @ 80—100 gallons per acre. 3. Spraying with 0·02% endrin @ 80—100 gallons per acre.
	2. Red cotton bug *Dysdercus cingulatus* Fb.	Andhra Pradesh, Assam, Bihar, Delhi, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.
	3. Cotton white fly *Bemisia tabaci* Genn.	Bihar, Delhi, Maharashtra, Punjab, Rajasthan.	Serious in Punjab, moderate elsewhere.	Spraying with 0·25% BHC or 0·02% endrin @ 80—100 gallons per acre.
	4. Cotton aphis *Aphis gossypii* Glov.	Andhra Pradesh, Assam, Delhi, Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	1. Spraying with 0·06% Nicotine sulphate @ 80—100 gallons per acre. 2. Dusting with 5% BHC @ 15—20 lb. per acre. 3. Spraying with 0·1% BHC or 0·025% parathion @ 80—100 gallons per acre.
	5. Dusky cotton bug *Oxycarenus laetus* Kirby	Andhra Pradesh, Assam, Bihar, Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.

6. Mealy bugs *Ferrisiana virgata* (Ckll.), *Pseudococcus corymbatus* Green	Bihar, Madras, Maharashtra, Mysore, Punjab, Rajasthan.	Mild	Spraying with 0·05% malathion @ 80—100 gallons per acre.
7. Scale insects *Pulvinaria maxima* Green *Saissetia nigra* Nietn. *Cerococcus hibisci* Green	Madras	Mild	Spraying with 0·05% malathion @ 80—100 gallons per acre.
8. Cotton thrips *Thrips tabaci* Lind. *Scirtothrips dorsalis* Hood	Andhra Pradesh, Madras, Maharashtra, Mysore, Punjab.	Moderate	Spraying with 0·16% BHC or 0·06% Nicotine sulphate @ 40—60 gallons per acre.
9. Pink bollworm *Platyedra gossypiella* Saund.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Serious	1. Fumigating seed with Methyl bromide @ 1 lb. per 1,000 cubic feet space. 2. Removing and destroying stubbles and fallen bolls after harvest.
10. Spotted bollworms *Earias insulana* Boisd. *E. fabia* Stoll.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra, Orissa, Punjab, Rajasthan, Tripura, Uttar Pradesh, West Bengal.	Serious	1. Removal of cotton sticks and stubbles in early winter before sprouting. 2. Spraying with 0·03% endrin @ 80—100 gallons per acre.
11. Cotton leaf roller *Sylepta derogata* Fb.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Tripura, Uttar Pradesh, West Bengal.	Moderate	1. Picking and destroying rolled leaves. 2. Spraying with 0·25 % DDT or BHC @ 80—100 gallons per acre. 3. Dusting with 5% DDT or BHC @ 15—20 lb. per acre.
12. Hairy caterpillars *Euproctis fraterna* Moore *E. lunata* Wlk. *Amsacta albistriga* Wlk. *A. moorei* Butler *Pericallia ricini* Fb.	Gujarat, Kerala, Madras, Maharashtra, Punjab, Rajasthan.	Mild	1. Dusting with 10% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% BHC @ 80—100 gallons per acre.
13. Cotton semiloopers *Anomis flava* Fb. *Tarache notabilis* Wlk.	Madras, Maharashtra, Mysore, Punjab.	Mild	Dusting with 5% BHC @15—20 lb. per acre.
14. Cotton bud moth *Phycita infusella* Meyr.	Assam, Kerala, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan.	Mild	Dusting with 5% BHC @15—20 lb. per acre.

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(1)	(2)	(3)	(4)	(5)
FIBRE CROPS —*contd.*	15. Gram caterpillar *Heliothis armigera* Hbn.	Andhra Pradesh, Kerala, Madras, Mysore.	Mild	Dusting with 5% BHC @15—20 lb. per acre.
Cotton—*contd.*	16. Grey weevil *Myllocerus maculosus* Desb.	Assam, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Moderate	Do.
	17. Cotton stem weevil *Pempheres affinis* Fst.	Andhra Pradesh, Assam, Bihar, Kerala, Madras, Mysore, Orissa, Rajasthan.	Moderate	Destruction of affected plants.
	18. Cotton stem borer *Sphenoptera gossypii* Cotes	Andhra Pradesh, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Punjab, Rajasthan.	Serious	Do.
	19. Surface grasshopper *Chrotogonus trachypterus* Blanch.	Maharashtra, Orissa, Punjab, Uttar Pradesh.	Moderate	Dusting with 10% BHC @15—20 lb. per acre.
	20. Cotton mites *Eriophyes gossypii* Banks *Tetranychus telarius* L. *T. bioculatus* Wood-Mason *Hemitarsonemus latus* Banks *Eutetranychus banksi* McGregor.	Andhra Pradesh, Gujarat, Maharashtra, Madras, Mysore, Punjab.	Moderate	1. Spraying with 0·025% parathion @ 80—100 gallons per acre. 2. Spraying with lime sulphur wash (1:2:16) @ 80—100 gallons per acre.

Schedule of Pest Control on Cotton

(Recommended by the Indian Central Cotton Committee)

A six-spray schedule, as shown below, to be instituted when the crop is about 10 weeks old :

1st	spray at	10 weeks	Endrin 0·2 lb.
2nd	,, ,,	12 ,, ...	Endrin 0·2 lb.
3rd	,, ,,	14 ,, ...	DDT/BHC 1+1 lb.
4th	,, ,,	16 ,, ...	Endrin 0·2 lb.
5th	,, ,,	18 ,, ...	DDT/BHC 1+1 lb.
6th	,, ,,	20 ,, ...	Endrin 0·2 lb.

The volume of spray might vary from 80 gallons per acre for the first spray to 120 gallons for the last spray, the average being about 100 gallons.

Note : (*i*) In the southern States, *viz.*, Andhra Pradesh, Mysore and Madras, spraying may be started when the crop is four to eight weeks old and then continued as above.

(*ii*) As cotton mites are attaining the status of a major pest of American cottons in almost all the southern States and Gujarat, wettable sulphur at the rate of ½ oz. per gallon of water may be added to each of the six sprays given in the above schedule.

Jute	1. Mealy bugs *Ferrisia virgata* Ckll. *Pseudococcus filamentosus* Ckll. var. *corymbatus* Green	West Bengal	Serious	Spraying with 0·06% malathion @ 50—60 gallons per acre
	2. Jute scale *Pinnaspis* sp.	West Bengal	Moderate	Do.
	3. Jute semilooper *Anomis sabulifera* Guen.	Assam, Bihar, Orissa, Tripura, Uttar Pradesh, West Bengal.	Serious	1. Spraying with 0·25% BHC or DDT @ 50—60 gallons per acre. 2. Dusting with 10% BHC @ 20—25 lb. per acre.
	4. Bihar hairy caterpillar *Diacrisia obliqua* Wlk.	Assam, Bihar, Orissa, Uttar Pradesh, West Bengal.	Moderate	1. Spraying with 0·25% to 0·5% BHC or DDT @ 50—60 gallons per acre. 2. Dusting with 10% BHC @ 20—25 lb. per acre.
	5. Lucerne caterpillar *Laphygma exigua* (Hbn.)	Assam, Bihar, Orissa, Uttar Pradesh, West Bengal.	Mild	Dusting with 5% BHC @ 20—25 lb. per acre.
	6. Jute stem weevil *Apion corchori* Marshall	Assam, Orissa, West Bengal.	Serious	Weeding and destruction of infested plants.
	7. Jute stem girdlers *Nupserha bicolor postbrunnea* Dutt	Bihar, Orissa, Uttar Pradesh, West Bengal.	Moderate	Dusting with 5% BHC @ 20—25 lb. per acre.
	8. Cricket *Brachytrypes achatinus* Stoll.	Assam, Bihar, West Bengal.	Serious	Mixing 10% BHC dust in soil @ 15—20 lb. per acre before sowing or when crop is germinating.
	9. Jute nematode *Meloidogyne javanica* Chitwood	West Bengal	Mild	—
	10. Mites *Tetranychus bioculatus* Wood-Mason. *Hemitarsonemus latus* Banks	Assam, Bihar, Orissa, Uttar Pradesh, West Bengal.	Moderate	Spraying with lime sulphur wash (1:2:16) @ 40—50 gallons per acre.
Sannhemp	1. Hairy caterpillars *Utethesia pulchella* L. *Argina cribraria* C. *A. syringa* Cram.	Andhra Pradesh, Bihar, Maharashtra, Madras, Orissa, Uttar Pradesh, West Bengal.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	2. Shoot borer *Enarmonia pseudonectis* Meyr.	Madhya Pradesh, Uttar Pradesh.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.

(1)	(2)	(3)	(4)	(5)
OILSEEDS				
Til	1. Leaf and Pod caterpillar *Antigastra catalaunalis* Dup.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Rajasthan, Uttar Pradesh, West Bengal.	Serious	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT or BHC @ 40—50 gallons per acre.
	2. Hawk moth *Acherontia styx* West.	Assam, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Uttar Pradesh.	Serious	1. Dusting with 5% BHC or DDT @ 15—20 lb. per acre. 2. Spraying with 0·2% DDT @ 40—50 gallons per acre.
	3. *Til* gall fly *Asphondylia sesami* Felt.	Gujarat, Kerala, Madhya Pradesh, Madras, Maharashtra.	Moderate	Removing and destroying galls.
Groundnut	1. Aphis *Aphis craccivora* Koch.	Andhra Pradesh, Gujarat, Madhya Pradesh, Madras, Maharashtra, Mysore.	Moderate	Spraying with 0·05% Nicotine sulphate or 0·1% HETP or 0·025% parathion @ 40—60 gallons per acre.
	2 Groundnut bug *Aphanus sordidus* Fb.	Andhra Pradesh, Gujarat, Maharashtra.	Mild	Dusting with 5% BHC @ 20—25 lb. per acre.
	3. Thrips *Scirtothrips dorsalis* Hood	Andhra Pradesh, Madras, Mysore	Mild	Spraying with 0·05% Nicotine sulphate @ 40—60 gallons per acre or dusting with 5% BHC @ 20—25 lb. per acre.
	4. *Kutra* (Red hairy caterpillars) *Amsacta albistriga* Wlk. *A. moorei* Butler	Andhra Pradesh, Gujarat, Madras, Madhya Pradesh, Maharashtra, Mysore, Punjab, Uttar Pradesh.	Serious	1. Dusting 10% BHC @ 20—25 lb. per acre. 2. Spraying with 0·5% BHC or 0·03% endrin or parathion @ 40—60 gallons per acre.
	5. Leaf miner *Stomopteryx nerteria* Meyr.	Andhra Pradesh, Madras, Mysore	Moderate	1. Destroying affected leaves. 2. Dusting 5% DDT @ 20—25 lb. per acre with the appearance of each brood. 3. Spraying with 0·25% DDT @ 40—60 gallons per acre twice in the season.

	6. Stem borer *Sphenoptera perroteti* Guer.	Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Madras, Maharashtra.	Mild	Pulling out of infested plants and burning them.
Safflower	1. Aphis *Dactynotus carthami* Hille Ris Lambers.	Andhra Pradesh, Maharashtra, Mysore.	Serious	Spraying with 0·2% BHC or 0·05% Nicotine sulphate @ 40—50 gallons per acre.
	2. Leaf eating caterpillar *Perigoea capensis* Guen.	Andhra Pradesh, Maharashtra, Mysore.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.
Mustard	1. Mustard aphis *Lipaphis erysimi* (Kalt.)	All over India	Serious	Spraying with 0·2% BHC or 0·05% Nicotine sulphate @ 80—100 gallons per acre.
	2. Painted bug *Bagrada cruciferarum* Kirk.	All over India	Moderate	Spraying with 0·2% BHC or 0·025% parathion @ 80—100 gallons per acre.
	3. Cabbage butterfly. *Pieris brassicae* L.	Assam, Himachal Pradesh, Madras, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Moderate	Spraying with 0·2% DDT or BHC @ 80—100 gallons per acre.
	4. Pea leaf miner *Phytomyza atricornis* Meig.	Assam, Bihar, Delhi, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·25% DDT @ 80—100 gallons per acre.
	5. Flea beetle *Phyllotreta cruciferae* Goeze.	Do.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	6. Mustard sawfly *Athalia proxima* Klug.	Assam, Bihar, Delhi, Madhya Pradesh, Madras, Maharashtra, Mysore, Punjab, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·1% DDT or BHC @ 80—100 gallons per acre.
Linseed	Linseed gall midge *Dasyneura lini* Barnes	Andhra Pradesh, Bihar, Delhi, Madhya Pradesh, Punjab, Uttar Pradesh.	Moderate	1. Spraying with 0·2% DDT @ 40—50 gallons per acre. 2. Setting up light traps.
Castor	1. Castor white fly *Trialeurodes ricini* Misra	Andhra Pradesh, Bihar, Madras, Maharashtra, Punjab.	Moderate	Spraying with 0·1% BHC or 0·025% parathion @ 100—150 gallons per acre.
	2. Castor semi-looper *Achaea janata* L.	Andhra Pradesh, Bihar, Delhi, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Uttar Pradesh.	Serious in Andhra Pradesh, moderate elsewhere.	1. Spraying with lead arsenate (1 lb. in 16 gallons of water) @ 100—150 gallons per acre. 2. Spraying with 0·16% DDT @ 100—150 gallons per acre. 3. Spraying with 0·03% endrin @ 100—150 gallons per acre.

(1)	(2)	(3)	(4)	(5)
OILSEEDS—*contd.*	3. Castor slug *Parasa lepida* Cram.	Andhra Pradesh, Madras, Orissa	Mild	Spraying with 0·16% DDT @ 100—150 gallons per acre.
Castor—*contd.*	4. Shoot and capsule borer *Dichocrocis punctiferalis* Guen.	Andhra Pradesh, Assam, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Uttar Pradesh. West Bengal.	Moderate	1. Dusting with 5% BHC @ 30—40 lb. per acre. 2. Spraying with 0·2% DDT or BHC @ 100—150 gallons per acre.
	5. Castor hairy caterpillars *Pericallia ricini* Fb.	Andhra Pradesh, Madhya Pradesh. Mysore, Orissa, Uttar Pradesh.	Moderate	1. Dusting with 5% BHC @ 30—40 lb. per acre. 2. Spraying with 0·1% to 0·2% BHC or DDT @ 100—150 gallons per acre.
	Euproctis lunata Wlk. *E. fraterna* Moore	Andhra Pradesh, Delhi, Madras, Mysore, Punjab, Uttar Pradesh	Moderate	Do.
	6. Tobacco caterpillar *Prodenia litura* Fb.	Uttar Pradesh	Moderate	Spraying with 0.1% DDT @ 100—150 gallons per acre.
FRUIT TREES				
Mango	1. Mango hoppers *Idiocerus clypealis* Leth. *I. atkinsoni* Leth. *I. niveosparsus* Leth.	All over India	Serious	1. Spraying with 0·25% DDT or 0·02% endrin @ 2—5 gallons per grafted tree and 5—10 gallons per seedling tree.
	2. Mango mealy bug *Drosicha mangiferae* Green	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Madhya Pradesh, Madras, Maharashtra, Orissa, Punjab, Uttar Pradesh, West Bengal.	Serious	1. Putting up sticky bands round main stems before the nymphs hatch. 2. Spraying with 0·06% malathion or 0·05% parathion @ 2—5 gallons per grafted tree and 5—10 gallons per seedling tree.
	3. Mango scale insects *Aspidiotus destructor* Sign. *Pulvinaria polygonata* Ckll. *P. psidii* Mask. *Parlatoria pergandii* Comst. *Lepidosaphes gloverii* (Pack.)	Bihar, Orissa, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·03% malathion or parathion @ 2—5 gallons per grafted tree and 5—10 gallons per seedling tree.
	4. Mango psylla *Apsylla cistellata* Buckt.	Bihar, Uttar Pradesh.	Moderate	Collecting and destroying galls.

5. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Andhra Pradesh, Bihar, Madhya Pradesh, Madras, Maharashtra, Orissa, Rajasthan, Uttar Pradesh.	Moderate	Plug the borer holes with cotton soaked with either kerosene oil, or petrol or ED/CT mixture, and then plaster the holes with mud.
6. Mango fruit flies *Dacus dorsalis* Hendel *D. zonatus* (Saund.)	All over India	Moderate	1. Destroying affected fruits. 2. Spraying with 0·25% DDT on the entire vegetation and hedges in the garden with a view to reduce fruit fly adult population.
7. Mango leaf gall fly *Procontarinia matteiana* Kieff. & Cecconi	Bihar, Orissa, Uttar Pradesh	Moderate	Collecting and destroying affected leaves.
8. Mango stem borers *Batocera rufomaculata* De Geer *B. rubus* L.	Andhra Pradesh, Assam, Kerala, Madhya Pradesh, Maharashtra, Mysore, Orissa.	Serious	Fumigating borer holes with petrol or carbon disulphide.
9. Leaf cutting weevil *Deporaus marginatus* Pasc.	Andhra Pradesh, Bihar, Kerala, Madhya Pradesh, Maharashtra, Uttar Pradesh.	Mild	Spraying with 0·2% DDT @ 2—5 gallons per grafted tree and 5—10 gallons per seedling tree.
10. Nut weevils *Cryptorhynchus mangiferae* Fb. *C. gravis* Fb.	Assam, Madras, Mysore, Orissa, Tripura, West Bengal.	Mild	Do.
11. Red ant *Oecophylla smaragdina* Fb.	Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Moderate	Burning and destroying the nest or spraying 0·25% BHC on the nest.
12. Termites *Neotermes* sp. *Odontotermes obesus* Ramb.	All over India	Moderate	Mixing 5% aldrin or chlordane dust in the soil around the tree.
Citrus			
1. Citrus psylla *Diaphorina citri* Kuw.	Bihar, Delhi, Himachal Pradesh, Kerala, Madhya Pradesh, Madras, Maharashtra, Punjab, Rajasthan, Tripura, Uttar Pradesh.	Sometimes serious in Punjab, moderate elsewhere.	Spraying with 0·06% Nicotine sulphate @ 1—2 gallons per tree.
2. Citrus white flies *Dialeurodes citri* (Riley & Howard) *Aleurocanthus spiniferus* Quaint. *A. woglumi* Ashby	Andhra Pradesh, Assam, Bihar, Delhi, Madhya Pradesh, Madras, Maharashtra, Mysore, Punjab, Uttar Pradesh.	Moderate to serious	1. Spraying with fish oil rosin soap (1 part in 25 parts of water) @1—2 gallons per tree. 2. Spraying with 0·1% HETP or BHC @1—2 gallons per tree.

(1)	(2)	(3)	(4)	(5)
FRUIT TREES—*contd.* Citrus—*contd.*	3. Green bug *Rhynchocoris humeralis* Thunb.	Assam, Tripura	Moderate	1. Spraying with fish oil rosin soap (1 part in 25 parts of water) @1—2 gallons per tree. 2. Spraying with 0·1% HETP or BHC @1—2 gallons per tree.
	4. Fluted scale *Icerya purchasi* Mask.	Andhra Pradesh, Kerala, Madras, Mysore.	Moderate	1. Liberating predaceous beetle *Rodolia* sp. 2. Spraying with 4% diesel oil emulsion during winter @ 1—2 gallons per tree.
	5. Red scale *Aonidiella aurantii* (Mask.)	Andhra Pradesh, Delhi, Himachal Pradesh, Orissa, Punjab.	Moderate	Spraying with 0·25% DDT or 0·05% parathion or 0·06% Nicotine sulphate @ 1—2 gallons per tree.
	6. Aphis *Toxoptera aurantii* Boy.	Andhra Pradesh, Bihar, Maharashtra, Orissa.	Mild	Spraying with 0·2% BHC or 0·05% Nicotine sulphate @ 1—2 gallons per tree.
	7. Lemon butterfly *Papilio demoleus* L.	All over India	Serious	Spraying with 0·25% DDT or BHC @1—2 gallons per tree.
	8. Fruit sucking moths *Othreis materna* L. *O. fullonia* Cl. *Achaea janata* L. *Calpe emarginata* Fb.	Andhra Pradesh, Assam, Bihar, Kerala, Madhya Pradesh, Madras, Maharashtra, Orissa, Punjab, Uttar Pradesh.	Serious	1. Removing larval food plants growing in and around orchards. 2. Spraying with 0·16% BHC or DDT @ 1—2 gallons per tree. 3. Baiting with lead arsenate and *gur* mixture (1 part of lead arsenate in 160 parts of *gur* solution). 4. Covering individual fruit with about 300 gauge alkathene or polythene bags, loosely tied with a few punctures at the bottom.
	9. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Andhra Pradesh, Bihar, Madhya Pradesh, Madras, Orissa, Punjab, Uttar Pradesh.	Moderate	Fumigating galleries with petrol or carbon sulphide.

	10. Citrus leaf miner *Phyllocnistis citrella* Staint.	All over India	Moderate	Spraying with 0·25% DDT or 0·06% Nicotine sulphate @ 1–2 gallons per tree.
	11. Slug caterpillar *Parasa lepida* Cram.	Andhra Pradesh	Mild	Spraying with 0·25% DDT @ 1–2 gallons per tree.
	12. Top shoot borer *Chelidonium cinctum* (Guer.)	Madras, Mysore	Moderate	1. Cutting and destroying the wilted shoots. 2. Fumigating the borer holes with petrol or carbon disulphide.
	13. Stem borer *Chloridolum alcmene* Thomson	Kerala, Madras, Mysore	Moderate	1. Cutting and destroying the wilted shoots. 2. Fumigating the borer holes with petrol or carbon disulphide.
	14. Orange beetle borer *Stromatium barbatum* (Fb.)	Assam, Bihar, Madhya Pradesh, Maharashtra, Mysore, Punjab, Uttar Pradesh, West Bengal.	Moderate	Fumigating the borer holes with carbon disulphide or petrol.
	15. Fruit fly *Dacus dorsalis* Hendel	Assam, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Destroying affected fruits and burying deep in the ground.
	16. Red ant *Oecophylla smaragdina* Fb.	All over India	Mild	Burning and destroying the nest or spraying 0·25% BHC on the nest.
	17. Termite *Odontotermes obesus* Ramb.	All over India	Mild	Mixing 5% BHC or aldrin dust in the soil around the tree.
	18. Citrus mites *Tertranychus sexmaculatus* Riley *T. hindustanicus* Hirst *Paratetranychus citri* McGregor	Andhra Pradesh, Assam, Delhi, Madras, Maharashtra, Mysore Punjab.	Mild	Spraying with lime sulphur wash (1 : 2 : 16) or 0·25% Aramite or 0.025% parathion @ 1–2 gallons per tree.
Apple	1. San Jose scale *Quadraspidiotus perniciosus* Comst.	Andhra Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Madras, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Serious	Spraying with 4% diesel oil emulsion (during winter) @ 1–2 gallons per tree.

(1)	(2)	(3)	(4)	(5)
FRUIT TREES —*contd.* Apple—*contd.*	2. Woolly aphis *Eriosoma lanigerum* (Hausm).	Assam, Himachal Pradesh, Jammu & Kashmir, Madras, Mysore, Punjab, Uttar Pradesh.	Serious	1. Spraying aerial forms with fish oil rosin soap or 0·06% Nicotine sulphate @ 2–3 gallons per tree. 2. Bury Para-dichloro-benzene crystals one foot from stem of the tree and 4 inches deep in a trench @1—4 oz. per tree.
	3. Tent caterpillar *Clisocampa indica* Wlk.	Himachal Pradesh, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·5% DDT @ 1–2 gallons per tree.
	4. Apple root borer *Dorysthenes hugelii* Redt.	Assam, Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh.	Moderate	1. Avoiding dry sandy soils for apple plantation. 2. Applying well-rotten manure to the plants. 3. Mechanical removal of the borers.
	5. Apple stem borer *Zeuzera* sp.	Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh.	Moderate	Fumigation of bored twigs and branches with petrol or carbon disulphide.
Apple, plum, peach & pear	Leaf defoliating and fruit eating beetles *Lachnosterna longipennis* Blanch. *Melolontha nepalensis* Blanch. *Adoretus duvauceli* Blanch. *A. versutus* Har. *A. nitidus* Ar. *Anomala lineatopennis* Blanch. *Anomala polita* Blanch.	Himachal Pradesh, Punjab, Uttar Pradesh.	Serious	Spraying with 0·15% to 0·25% DDT or 0·25% lead arsenate @ 2—5 gallons per tree.
Apricot	Leaf cutworm *Parasa peranda* Wlk.	Himachal Pradesh, Jammu & Kashmir, Punjab.	Moderate	Spraying with 0·25% DDT @ 1–2 gallons per tree.
Peach	1. Leaf curling aphis *Anuraphis helichrysi* Kalt.	Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh.	Serious	1. Spraying during winter with 0·5% DDT against newly hatched nymphs @ 1–2 gallons per tree.

				2. Removal of golden rod plants in the neighbourhood of peach trees wherever possible.
	2. Peach leaf scale *Pseudaulacaspis pentagona* Targ.	Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh.	Serious	1. Spraying with fish oil rosin soap (½ lb. in 1 gallon of water) @ 1–2 gallons per tree. 2. Spraying with 0·03% parathion @ 1–2 gallons per tree.
	3. San Jose scale *Quadraspidiotus perniciosus* Comst.	Assam, Himachal Pradesh, Jammu & Kashmir, Madras, Maharashtra, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Serious	Spraying with 4% diesel oil emulsion (during winter) @ 1–2 gallons per tree.
	4. Fruit flies *Dacus ferrugineus* Fb. *D. zonatus* Saund.	Do.	Moderate	Removal and destruction of affected fruits.
Guava	1. Mealy scale *Pulvinaria psidii* Mask.	Orissa	Serious	Spraying with 0·03% diazinon @ 1–2 gallons per tree.
	2. Fruit flies *Dacus ferrugineus* Fb. *D. zonatus* Saund.	All over India	Serious	Removal and destruction of affected fruits.
	3. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Madhya Pradesh, Maharashtra, Uttar Pradesh.	Moderate	Fumigating the galleries with petrol or carbon disulphide.
Walnut	1. Tree borer *Batocera horsfieldi* Hope	Himachal Pradesh, Jammu & Kashmir, Punjab.	Mild	Fumigating borer holes with petrol or carbon disulphide.
	2. Weevil *Alcidodes porrectirostris* Marshall	Himachal Pradesh, Jammu & Kashmir, Punjab.	Mild	Spraying with 0·25% BHC @ 1–2 gallons per tree.
Phalsa	*Phalsa* bug *Scutellera nobilis* Fb.	Uttar Pradesh	Mild	Dusting with 5% BHC @ 20—30 lb. per acre.
Pomegranate	*Anar* butterfly *Virachola isocrates* Fb.	Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Madras, Mysore, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Moderate	1. Covering of fruits wherever possible with cloth bags. 2. Spraying with 0·25% DDT @ 1–2 gallons per tree.

(1)	(2)	(3)	(4)	(5)
FRUIT TREES —*contd.*	1. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Bihar, Madhya Pradesh, Uttar Pradesh.	Moderate	Fumigating the galleries with petrol or carbon disulphide.
Litchi	2. Fruit stone borer *Argyroploce illepida* Butler	Tripura	Serious	Spraying with 0·25% DDT @ 2—5 gallons per tree.
	3. Litchi leaf curling mite *Eriophyes* sp.	Assam, Bihar, Uttar Pradesh	Moderate	Spraying with lime sulphur wash (1:2:16) or 0·025% parathion @ 2—5 gallons per tree.
Sapota	1. Mealy bugs *Phenacoccus iceryoides* Green *Pseudococcus lilacinus* Ckll.	Andhra Pradesh	Mild	Spraying with 0·03% parathion @ 2—5 gallons per tree.
	2. Chikoo moth *Nephoteryx eugraphella* Rag.	Madhya Pradesh, Uttar Pradesh	Mild	Spraying with 0·2% DDT @ 2—5 gallons per tree.
Ber	*Ber* fruit fly *Carpomyia vesuviana* Costa	All over India	Moderate	1. Removing wild *Ber* bushes from the vicinity of grafted *Ber* trees. 2. Spraying with 0·1% DDT @ 2—3 gallons per tree.
Banana	1. Banana aphis *Pentalonia nigronervosa* Coq.	Kerala	Mild	Spraying with 0·06% Nicotine sulphate @ 150—200 gallons per acre.
	2. Banana weevils *Cosmopolites sordidus* Germ. *Odoiporus longicollis* Oliv.	Andhra Pradesh, Assam, Bihar, Gujarat, Kerala, Madras, Maharashtra, Mysore, Orissa, Uttar Pradesh, West Bengal.	Moderate	1. Discarding infested suckers. 2. Spraying with 0·16 % DDT around the base of the plants/clumps @ 50—75 gallons per acre.
	3. Banana beetle *Nodostoma subcostatum* Jac.	Assam, Bihar, Maharashtra, Orissa, Uttar Pradesh, West Bengal.	Mild	Spraying with 0·16% DDT @ 150—200 gallons per acre.
Fig	Fig leaf caterpillar *Phycodes minor* Moore	Uttar Pradesh	Moderate	Spraying with 0·2% DDT @ 1–2 gallons per tree.
Grapevine	1. Scale *Aspidiotus cydoniae* Comst.	Andhra Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab.	Moderate	1. Spraying with fish oil rosin soap (1 part in 40 parts of water) @ 150—200 gallons per acre. 2. Spraying with 0·03% parathion @ 150—200 gallons per acre.

	2. Grapevine thrips *Rhipiphorothrips cruentatus* Hood	Andhra Pradesh, Delhi, Madras, Maharashtra, Mysore, Orissa Punjab, Uttar Pradesh.	Moderate	Spraying with 0·05% Nicotine sulphate or 0·16% DDT @ 150—200 gallons per acre.
	3. Grapevine flea beetle *Scelodonta strigicollis* Mots.	Andhra Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore, Punjab.	Serious	Spraying with 0·25% DDT @ 150—200 gallons per acre.
	4. Grapevine chafers *Adoretus lasiophygus* Burm. *A. versutus* Har.	Do.	Serious	Do.
	5. Vine girdler beetle *Sthenias grisator* Fb.	Maharashtra, Punjab, South India	Moderate	Cutting the attacked branches below the girdling point and burning.
Pineapple	1. Mealy bug *Pseudococcus bromeliae* Bouche	Andhra Pradesh, Assam, Orissa, West Bengal.	Mild	Spraying with 0·025% parathion @ 60—80 gallons per acre.
	2. Slug caterpillar *Parasa lepida* Cram.	Do.	Mild	Spraying with 0·16% DDT @ 60—80 gallons per acre.
Custard Apple	Mealy bugs *Pseudococcus virgatus* Ckll. *P. lilacinus* Ckll. *Ferrisiana virgata* Ckll.	Andhra Pradesh, Orissa	Mild	Spraying with 0·03% parathion @ 2—4 gallons per tree.
Jamun	White fly *Dialeurodes eugeniae* Mask.	All over the plains of India	Moderate	Spraying with 0·16% BHC @ 5—10 gallons per tree.
Loquat	Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Andhra Pradesh, Madras, Maharashtra, Mysore, Punjab. Uttar Pradesh.	Mild	Fumigating the galleries with petrol or carbon disulphide.
Melons	Fruit flies *Dacus cucurbitae* Coq. *D. ciliatus* Loew.	All over India	Moderate	Removing and destroying infested fruits and burying deep in the soil at regular intervals.
Jack fruit	1. Shoot borer *Margaronia caesalis* Wlk.	Assam, Bihar, Delhi, Madhya Pradesh, Maharashtra, Orissa, South India, Uttar Pradesh.	Serious	Fumigating borer holes with petrol or carbon disulphide.
	2. Jack bud weevil *Ochyromera artocarpi* M.	Do.	Moderate	1. Spraying with 0·25% DDT @ 5—10 gallons per tree. 2. Destroying infested and fallen buds and fruits.
Papaya	Ak grasshopper *Poecilocerus pictus* Fb.	Bihar, Delhi, Punjab, Uttar Pradesh.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.

(1)	(2)	(3)	(4)	(5)
FRUIT TREES —*contd.*				
Singhara	1. Singhara beetle *Galerucella birmanica* Jac.	Bihar, Delhi, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh.	Serious	Dusting with 5% BHC @ 20—30 lb. per acre.
	2. Blue beetle *Altica cyanea* Web.	Delhi	Moderate	Dusting with 5% BHC @ 20—30 lb. per acre.
VEGETABLES				
Sweet Potato	1. Sweet potato caterpillar *Herse convolvuli* L.	Andhra Pradesh, Bihar, Maharashtra, Orissa, Punjab, Uttar Pradesh.	Mild	Spraying with 0·25% DDT @ 60—80 gallons per acre.
	2. Sweet potato weevil *Cylas formicarius* Fb.	Andhra Pradesh, Kerala, Bihar, Madhya Pradesh, Madras, Mysore, Orissa, Rajasthan, Uttar Pradesh.	Moderate	1. Spraying with 0·16% DDT at the base of plants. 2. Keeping tubers well covered in the soil to avoid direct egg laying.
	3. Tortoise beetles *Cassida circumdata* Hbst. *C. indicola* Duv.	Do.	Moderate	Spraying with 0·16% DDT @ 60—80 gallons per acre.
Potato	1. Potato aphis *Myzus persicae* Sulz.	All over India	Moderate	Spraying with 0·06% Nicotine sulphate or 0·025% parathion @ 60—80 gallons per acre.
	2. Jassid *Empoasca devastans* Dist.	Assam, Bihar, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Serious	Spraying with 0·16% DDT @ 60 -80 gallons per acre.
	3. Cutworms *Agrotis ypsilon* Rott. *A. flammatra* Schiff.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Himachal Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Moderate to Serious	1. Mixing 5% DDT dust in soil before sowing @ 20—25 lb. per acre. 2. Dusting with 5% DDT or heptachlor or chlordane near the base of plants @ 15—20 lb. per acre. 3. Spraying the base of the plants with 0·03% aldrin @ 60—80 gallons per acre.
	4. Epilachna beetles *Epilachna vigintioctopunctata* Fb. *E. dodecastigma* Muls. *E. ocellata* Redt.	Assam, Himachal Pradesh, Madras, Maharashtra, Mysore, Orissa, Punjab, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·2% DDT @ 60—80 gallons per acre.

	5. White grubs *Xylotrupes gideon* L. *Lachnosterna longipennis* Blanch. *Anomala* spp.	Himachal Pradesh, Uttar Pradesh	Moderate	Mixing 10% DDT or aldrin dust @ 15—20 lb. per acre in soil before sowing.
	6. Mole cricket *Gryllotalpa africana* Palisot De Beauvois	All over India	Serious in West Bengal, mild elsewhere.	Mixing 5% DDT or aldrin dust in soil @ 15—20 lb. per acre before sowing.
	7. Potato eelworms *Meloidogyne incognita* Chitwood	Himachal Pradesh	Serious	1. Fumigating soil with DD soil fumigant. 2. Selecting healthy tubers for planting. 3. Growing non-susceptible crops in infested land for at least 8 years.
	Golden Nematode *Heterodera rostochiensis* Wall.	Madras (localised in Ootacamund)	Serious	
Brinjal	1. Brinjal aphis *Aphis gossypii* Glov.	Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Mysore, Orissa, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·2% BHC or 0·06% Nicotine sulphate @ 60—80 gallons per acre.
	2. Lace wing bug *Urentius echinus* Dist.	All over the plains of India	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·2% BHC or 0·004% Pyrocolloid @ 60—80 gallons per acre.
	3. Mealy bug *Phenacoccus insolitus* Green	Andhra Pradesh, Bihar, Kerala, Madras, Mysore, Orissa, Uttar Pradesh, West Bengal.	Moderate	Spraying with 0·06% malathion @ 60—80 gallons per acre.
	4. Jassid *Empoasca devastans* Dist.	Andhra Pradesh, Delhi, Madhya Pradesh, Madras, Maharashtra, Punjab, Rajasthan, Uttar Pradesh.	Moderate	Spraying with 0·16% DDT @ 60—80 gallons per acre.
	5. Stem borer *Euzophera perticella* Rag.	All over the plains of India	Serious	Removing affected shoots followed by spraying with 0·25% DDT @ 60—80 gallons per acre.
	Fruit and shoot borer *Leucinodes orbonalis* Guen.	Do.	Serious	1. Removing infested shoots fruits and fallen leaves. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.

(1)	(2)	(3)	(4)	(5)
VEGETABLES				
—*contd.* Brinjal—*contd.*	7. Leaf roller *Eublemma olivacea* Wlk.	Orissa, Punjab, Rajasthan, Uttar Pradesh.	Mild	Spraying with 0·16% DDT @ 60—80 gallons per acre.
	8. Epilachna beetle *Epilachna vigintioctopunctata* Fb.	Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Himachal Pradesh, Kerala, Madras, Maharashtra, Mysore, Pondicherry, Punjab, Rajasthan, Uttar Pradesh, West Bengal.	Serious	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre. 3. Dusting with Calcium arsenate mixed with lime (1 : 4) @ 15—20 lb. per acre.
	9. Mite *Tetranychus telarius* L.	Andhra Pradesh, Orissa	Moderate	1. Spraying with 0·2% HETP @ 60—80 gallons per acre. 2. Spraying with 0·025% parathion or 0·25% Aramite or Akar @ 60—80 gallons per acre.
	10. Root gall eelworm *Meloidogyne* sp.	Bihar, Delhi, Uttar Pradesh	Moderate	1. Fumigating soil with DD soil fumigant. 2. Growing non-susceptible crops in infested land for at least 8 years.
Cabbage, Cauliflower and Knolkhol	1. Cabbage aphis *Brevicoryne brassicae* L.	All over India	Serious	Spraying with 0·06% Nicotine sulphate or 0·003% Pyrocolloid @ 40—60 gallons per acre.
	2. Diamond back moth *Plutella maculipennis* (Curt.)	Do.	Serious	1. Dusting with Pyrodust @ 15—20 lb. per acre. 2. Spraying with 0·16% DDT @ 40—60 gallons per acre.
	3. Cabbage butterfly *Pieris brassicae* L.	Assam, Himachal Pradesh, Madras, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·16% DDT @ 40—60 gallons per acre.
	4. Cabbage leaf webber *Crocidolomia binotalis* Zell.	Andhra Pradesh, Himachal Pradesh, Uttar Pradesh.	Mild	Spraying with 0·16% DDT @ 40—60 gallons per acre.
	5. Cabbage borer *Hellula undalis* Fb.	Orissa	Mild	Do.

Turnip, Radish and other cruciferous Vegetable crops	1. Mustard aphis *Lipaphis eryssimi* (Kalt.)	All over India	Moderate	Spraying with 0·06% Nicotine sulphate or 0·025% parattion @ 40—60 gallons per acre.
	2. Painted bug *Bagrada cruciferarum* Kirk.	Do.	Moderate	1. Spraying with 0·16% DDT. @ 40—60 gallons per acre. 2. Dusting with 5% BHC @ 15—20 lb. per acre.
	3. Flea beetle *Phyllotreta cruciferae* Goez.	Do.	Moderate	1. Spraying with lead arsenate (1 lb. lead arsenate in 16 gallons of water) or 0·25% DDT @ 40—60 gallons per acre. 2. Dusting with 3% BHC or Pyrodust @ 15—20 lb. per acre.
	4. Mustard sawfly *Athalia proxima* Klug.	Do.	Moderate	Dusting with 5% BHC or DDT @ 15—20 lb. per acre.
Palak	Blue beetle *Altica caerulescens* Baly.	Punjab	Mild	Dusting with Pyrodust @ 15—20 lb. per acre.
Lady's finger	1. Jassid *Empoasca devastans* Dist.	Andhra Pradesh, Assam, Delhi, Madras, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Moderate	Spraying with 0·16% DDT @ 60—80 gallons per acre.
	2. Red cotton bug *Dysdercus cingulatus* Fb.	Bihar, Madhya Pradesh, Orissa, Uttar Pradesh.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	3. Spotted boll worms *Earias insulana* Boisd. *E. fabia* Stoll.	All over India	Moderate	1. Removing and destroying infested fruits. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre every 15—20 days.
	4. Banded blister beetles *Mylabris phalerata* Pall. *M. pustulata* Thunb.	Andhra Pradesh, Assam, Bihar, Delhi, Orissa, Punjab, Uttar Pradesh.	Serious	Hand netting of beetles.
	5. Redspider mite *Tetranychus telarius* L.	Andhra Pradesh, Assam, Bihar, Delhi, Orissa, Punjab, Uttar Pradesh, West Bengal.	Serious	1. Spraying with 0·2% HETP @ 60—80 gallons per acre. 2. Spraying with 0·025 % parathion or 0·25% Aramite or Akar @ 60—80 gallons per acre. 3. Spraying with lime sulphur wash (1:2:16) @ 60—80 gallons per acre.

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VEGETABLES—*contd.*				
Tomato	1. Jassid *Empoasca devastans* Dist.	Delhi, Orissa, Punjab	Serious	Spraying with 0·16% DDT @ 60—80 gallons per acre.
	2. Fruit borer *Heliothis armigera* Hbn.	Assam, Madhya Pradesh, Madras, Punjab.	Moderate	1. Removal and destruction of affected fruits. 2. Dusting with 5% DDT @ 15—20 lb. per acre. 3. Spraying with 0·16% DDT @ 60—80 gallons per acre.
	3. Root gall eelworm *Meloidogyne* sp.	Andhra Pradesh, Bihar, Delhi, Uttar Pradesh.	Serious	1. Fumigating soil with DD soil fumigant. 2. Growing non-susceptible crops in infested land for at least 8 years.
Beans	1. Bean aphis *Aphis craccivora* Koch.	All over India	Moderate	1. Spraying with 0·06% Nicotine sulphate @ 60—80 gallons per acre. 2. Spraying with 0·004% Pyrocolloid @ 60—80 gallons per acre.
	2. Pod borers *Adisura atkinsoni* Moore *Maruca testutalis* Geyer	Andhra Pradesh, Delhi, Himachal Pradesh, Punjab, Uttar Pradesh.	Moderate	Spraying with 0·1 % lindane @ 60—80 gallons per acre.
Chilli	1. Chilli thrips *Scirtothrips dorsalis* Hood	Andhra Pradesh, Bihar, Delhi, Kerala, Madhya Pradesh, Madras, Maharashtra, Mysore, Orissa, Pondicherry, Punjab, Rajasthan.	Serious	1. Spraying with 0·1% BHC @ 40—60 gallons per acre. 2. Dusting with 5% BHC @ 15—20 lb. per acre.
	2. Pod borer *Prodenia litura* Fb.	Andhra Pradesh	Mild	Spraying with 0·1% lindane or 0·1% DDT @ 40—60 gallons per acre.
Onion & Garlic	Onion thrips *Thrips tabaci* Lind.	Andhra Pradesh, Assam, Bihar, Himachal Pradesh, Madhya Pradesh, Madras, Mysore, Punjab, Rajasthan.	Serious in Punjab, moderate elsewhere.	1. Spraying with 0·1% BHC or DDT @ 30—50 gallons per acre. 2. Dusting with 5% BHC @ 15—20 lb. per acre.

Cucurbits	1. Cucurbit aphis *Aphis malvae* Koch.	Andhra Pradesh, Maharashtra, Orissa, Uttar Pradesh.	Moderate	Spraying with 0·06% Nicotine sulphate or 0·025% parathion @ 40—60 gallons per acre.
	2. Stink bug *Aspongopus janus* Fb.	Bihar, Kerala, Punjab, Uttar Pradesh, West Bengal.	Serious	Dusting with 2·5% BHC @ 15—20 lb. per acre.
	3. Fruit flies *Dacus cucurbitae* Coq. *D. ciliatus* Loew.	All over India	Serious	1. Collecting and destroying the affected fruits. 2. Baiting with malathion and protein hydrolyzate (1 lb. protein hydrolyzate+2·5 lb. malathion 50% W.P. in 1 gallon of water).
	4. Red pumpkin beetles *Aulacophora foveicollis* Lucas *A. intermedia* Jac.	All over India	Serious	1. Dusting with 2·5% BHC or 1% lindane @ 15—20 lb. per acre. 2. Spraying with 0·1% lindane @ 40—60 gallons per acre.
	5. Banded blister beetle *Mylabris pustulata* Thunb.	All over India	Moderate	1. Hand netting of beetles. 2. Dusting with 2·5% BHC @ 15—20 lb. per acre.
	6. Mite *Tetranychus cucurbitae* R. & S.	Punjab, Uttar Pradesh	Mild	1. Spraying with 0·2% HETP @ 40—60 gallons per acre. 2. Spraying with 0·025% parathion or 0·25% Aramite or Akar @ 40—60 gallons per acre. 3. Spraying with lime sulphur wash (1:2:16) @ 40—60 gallons per acre.
Colocasia	1. Tobacco caterpillar *Prodenia litura* Fb.	Andhra Pradesh	Moderate	Dusting with 5% BHC @ 15—20 per acre.
	2. Flea beetle *Monolepta signata* Oliv.	Andhra Pradesh, Kerala, Orissa, Uttar Pradesh.	Mild	Do.
PLANTATION CROPS Tea	1. Tea mosquitoes *Helopeltis antonii* Sign. *H. febriculosa* Ber. *H. theivora* Waterhouse	Assam, Kerala, Madras, Mysore, West Bengal.	Serious	1. Spraying with 0·1% DDT @ 60—80 gallons per acre at least 3 weeks before pickings. 2. Collecting bugs by handnets and killing by dropping in kerosenised water.

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PLANTATION CROPS—*contd.*				
Tea—*contd.*	2. Tea looper *Buzura suppressaria* G.	Assam, Kerala, Madras, Mysore	Moderate	Spraying with 0·16% DDT @ 60—80 gallons per acre.
	3. Tea red slugs *Heterusia cingala* Moore *H. magnifica* Butler	Assam, West Bengal	Serious	Do.
	4. Bag worm *Clania crameri* West.	Assam	Serious	Do.
	5. Termites *Microtermes* sp.	Assam, Kerala, Madras, Mysore	Moderate	Mixing 5% aldrin or dieldrin dust @ 20 lb. per acre.
	6. Nematode *Meloidogyne javanica* Chitwood.	Assam, Madras, West Bengal	Serious	Treating soil with DD soil fumigant @ 400 lb. per acre.
	7. Red spiders (Tea red mites) *Tetranychus bioculatus* Wood-Mason *Oligonychus coffeae* Nietner	Assam, Kerala, Madras, Mysore, West Bengal.	Moderate	Spraying with lime sulphur wash (1:2:16) @ 60—80 gallons per acre.
	8. Orange mite *Phytotipalpus* sp.	Do.	Mild	Do.
Coffee	1. Green bug *Coccus viridis* Green	Kerala, Madras, Mysore	Serious	1. Spraying with 0·02% parathion or 0·1% HETP @2–3 gallons per plant. 2. Spraying with fish oil resin soap @2–3 gallons per plant.
	2. Red bug *Saissetia hemispherica* Targ.	Do.	Serious	Do.
	3. Cutworm *Agrotis segetum* Schiff.	Do.	Moderate	1. Mixing 5% DDT dust in soil before sowing @ 20—25 lb. per acre. 2. Dusting with 5% DDT or heptachlor or chlordane near the base of plants @ 15—20 lb. per acre. 3. Spraying the base of plants with 0·03% aldrin @ 60—80 gallons per acre.

	4. Shot hole borer *Xyleborus morstatti* Hdgn.	Do.	Moderate	Pruning and removing affected branches.
	5. Coffee stem borer *Xylotrechus quadripes* Chevr.	Do.	Serious in Mysore, moderate elsewhere.	1. Spraying with 0·25% DDT @ 2–3 gallons per plant. 2. Scrubbing or swabbing with 4% BHC suspension.
	6. Red borer *Zeuzera coffeae* Nietner	Do.	Moderate	Pruning and removing affected branches.
	7. Coffee grasshopper *Aularches miliaris* L.	Do.	Moderate	Dusting with 5% BHC @ 20—30 lb. per acre.
Cashewnut	1. Tea mosquito *Helopeltis antonii* Sign.	Andhra Pradesh, Kerala, Madras, Orissa.	Serious	Spraying with 0·16% DDT @ 2–3 gallons per tree.
	2. Leaf thrips *Selenothrips rubrocinctus* Giard	Do.	Serious	Spraying with 0·2% BHC @ 2–3 gallons per tree.
	3. Leaf caterpillars *Chelaria haligramma* M. *Circula trifenestrata H.*	Kerala, Madras	Moderate	Spraying with 0·25% DDT @ 2–3 gallons per tree.
	4. Leaf miner *Acrocercops syngramma* Meyr.	Do.	Moderate	Spraying with 0·03% parathion @ 2–3 gallons per tree.
	5. Cashew borer *Plocaederus ferrugineus* L.	Kerala	Serious	Fumigating borer holes with petrol or carbon disulphide.
Rubber	1. Bark eating caterpillars *Comocritis* spp. *Aetheraitis* spp.	Kerala	Mild, appears occasionally.	Spraying with 0·25% DDT @ 3–4 gallons per tree.
	2. Termite *Glyptotermes dilatatus* Havil.	Kerala	Mild	Mixing 5% aldrin dust in the soil around the tree.
Cacao	1. Mealy bug *Pseudococcus citri* Risso	Kerala	Mild	Spraying with 0·06% malathion @ 1–2 gallons per tree.
	2. Cacao thrips *Selenothrips rubrocinctus* Giard	Kerala	Serious	Spraying with 0·2% BHC @ 1–2 gallons per tree.
Coconut	1. Coconut scale *Aspidiotus destructor* Sign.	Andhra Pradesh, Kerala, Madras.	Moderate	Spraying with 0·025% parathion @1–2 gallons per tree.
	2. Black headed caterpillar *Nephantis serinopa* Meyr.	Andhra Pradesh, Kerala, Madras, Orissa, West Bengal.	Moderate	1. Cutting out infested fronds. 2. Spraying with 0·2% DDT @ 1–2 gallons per tree.
	3. Slug caterpillars *Contheyla rotunda* Hmps. *Macroplectra nararia* Moore *Parasa lepida* Cram.	Andhra Pradesh, Kerala, Madras, Maharashtra, Mysore.	Moderate	Spraying with 0·2% DDT @ 1–2 gallons per tree.

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PLANTATION CROPS—*contd.* Coconut—*contd.*	4. Rhinoceros beetle *Oryctes rhinoceros* L.	Andaman & Nicobar Islands, Andhra Pradesh, Assam, Kerala, Madras, Maharashtra, Mysore, Orissa, West Bengal.	Serious	1. Hooking out beetles from affected crowns. 2. Spraying BHC on breeding pits. 3. Filling the leaf axils with 5% BHC or chlordane dust mixed with equal quantity of sand or sawdust.
	5. Red palm weevil *Rhynchophorus ferrugineus* Fb.	Andhra Pradesh, Assam, Kerala, Madras, Maharashtra, Mysore, Orissa.	Moderate	1. Closing the holes with sand mixed with BHC or chlordane 5% dust to prevent entry of weevils in stem for egg laying. 2. Injection of 1% Pyrenone in the holes (1 part pyrethrin with 10 parts piperonyl butoxide).
	6. Cockchafer beetle *Leucopholis coneophora* Burm.	Kerala, Madras, Maharashtra	Moderate	1. Dusting 5% BHC or spraying 0·25% BHC on breeding places. 2. Applying chlordane 5% dust in the soil @ 28 lb. per acre.
	7. Termite *Odontotermes obesus* Ramb.	Kerala, Maharashtra, Mysore	Moderate	Applying BHC 10% dust @ 55 lb. per acre in the nursery.
Arecanut	1. Arecanut aphis *Cerataphis lataniae* Boisd.	Andhra Pradesh	Mild	Spraying with 0·05% Nicotine sulphate @ 1–1½ gallons per tree.
	2. Scales *Chionaspis dilatata* Green *Aonidiella orientalis* Newst. *Pinnaspis aspidistrae* Sign.	Andhra Pradesh, Kerala, Mysore	Moderate	Spraying with 0·03% parathion @ 1–1½ gallons per tree.
	3. Mealy bugs *Dysmicoccus brevipes* Ckll. *Icerya aegyptiaca* Dougl.	Kerala, Mysore	Moderate	Do.
	4. Red mite *Raoiella indica* Hirst.	Kerala, Mysore	Serious	Spraying with 0·03% parathion @ 1–1½ gallons per tree.
Betelvine	1. Betelvine bugs *Disphinctus politus* Wlk.	Andhra Pradesh, Madhya Pradesh, Madras, Mysore, Orissa, Uttar Pradesh.	Serious	1. Dusting with Pyrodust @ 20—25 lb. per acre. 2. Spraying with 0·1% DDT @ 80—100 gallons per acre.
	D. maesarum Kirk.	Maharashtra		

	2. Mealy bugs *Ferrisiana virgata* Ckll. *Lepidosaphes & Pseudococcus* spp.	Madhya Pradesh, Madras, Mysore, Uttar Pradesh.	Moderate	Spraying with 0·06% malathion @ 80—100 gallons per acre.
NARCOTIC DRUGS Tobacco	1. Green peach aphid *Myzus persicae* (Sulz.)	Andhra Pradesh, Madras Mysore, Orissa.	Serious in Andhra Pradesh and Orissa, moderate elsewhere.	Spraying with 0·06% Nicotine sulphate @ 60—80 gallons per acre.
	2. White fly *Bemisia tabaci* Guen.	Andhra Pradesh, Bihar, Maharashtra.	Moderate	Spraying with 0·16% BHC @ 60—80 gallons per acre.
	3. Tobacco thrips *Thrips tabaci* Lind.	Andhra Pradesh, Assam, Madras, Maharashtra, Mysore.	Mild	Spraying with 0·06% Nicotine sulphate or 0·1% DDT @ 60—80 gallons per acre.
	4. Cutworms *Agrotis ypsilon* Rott. *A. flammatra* Schiff.	Delhi, Madhya Pradesh, Madras, Maharashtra, Uttar Pradesh.	Moderate	1. Dusting the soil around base of plants with 5% DDT or aldrin or chlordane or heptachlor @ 15—20 lb. per acre. 2. Mixing 5% DDT in soil before sowing @ 20—25 lb. per acre. 3. Spraying the base of the plants with 0·03% aldrin @ 60—80 gallons per acre.
	5. Lucerne caterpillar *Laphygma exigua* Hbn.	Andhra Pradesh, Madras, Mysore	Serious	Dusting with 5% BHC @ 15—20 lb. per acre.
	6. Semi-looper *Plusia signata* Fb.	Do.	Moderate	Do.
	7. Tobacco capsule borers *Heliothis armigera* Hbn. *H. assulta* Gn.	Andhra Pradesh, Assam Madras, Orissa.	Mild	Spraying with 0·2% DDT @ 60—80 gallons per acre.
	8. Tobacco stem borer *Gnorimoschema heliopa* Low.	All over India	Moderate	1. Weeding out seedlings with gall like swellings. 2. Spraying nursery beds with 0·2% DDT @ 20—30 gallons per acre.
	9. Tobacco caterpillar *Prodenia litura* Fb.	Do.	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·25% DDT @ 60—80 gallons per acre.

(1)	(2)	(3)	(4)	(5)
NARCOTIC DRUGS—*contd.* Tobacco—*contd.*	10. Tobacco grasshoppers *Acrida exaltata* L. *Atractomorpha crenulata* Fb.	Andhra Pradesh, Madras, Mysore, Orissa.	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.
	11. Mole cricket *Gryllotalpa africana* Pal.	Andhra Pradesh, Madras, Mysore, Orissa.	Mild	Mixing 5% BHC in the soil @ 20—30 lb. per acre.
	12. Ground beetles *Mesomorphus villiger* Blanch. *Seleron latipes* Guer. *Opatroides frater* Fairm.	Andhra Pradesh, Madras, Mysore	Mild	Dusting with 5% DDT or BHC @ 15—20 lb. per acre.
	13. Eelworm *Meloidogyne* sp.	Andhra Pradesh, Gujarat, Mysore	Mild	1. Fumigating soil with DD soil fumigant. 2. Growing non-susceptible crops in infested land for at least 8 years.
Poppy	1. Cutworms *Agrotis ypsilon* Rott. *A. spinifera* Hbn.	Kerala, Madras, Mysore	Moderate	1. Dusting with 5% DDT or aldrin or chlordane or heptachlor around base of plants @ 15—20 lb. per acre. 2. Mixing 5% DDT in soil before sowing @ 20—25 lb. per acre. 3. Spraying the base of the plants with 0·03% aldrin @ 60—80 gallons per acre.
	2. Poppy weevils *Mylloceras* sp. *Tanymecus indicus* Fst.	Punjab, Uttar Pradesh	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Mixing 5% BHC dust in the soil @ 20—30 lb. per acre.
FODDER CROPS				
Lucerne and Berseem	1. Aphid *Aphis craccivora* Koch.	Punjab	Moderate	Spraying with 0·2% BHC @ 40—60 gallons per acre.
	2. Lucerne caterpillar *Laphygma exigua* Hbn.	Andhra Pradesh, Bihar, Delhi, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, West Bengal.	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	3. Weevil *Hypera variabilis* Hbst.	Punjab	Mild	Dusting with 5% BHC @ 15—20 lb. per acre.

SPICE CROPS				
Pepper	1. Scales *Lepidosaphes piperis* Green *Lecanium marsupiale* Green	Kerala, Mysore	Serious	Spraying with fish oil rosin soap (2 oz. per gallon of water) @ 40—60 gallons per acre.
	2. Pepper mealy bug *Pseudococcus virgatus* Ckll.	Do.	Serious	Spraying with 0·08% malathion @ 40—60 gallons per acre.
	3. Flea beetle *Longitarsus nigripennis* Mots.	Do.	Moderate	1. Dusting with 5% BHC @ 15—20 lb. per acre. 2. Spraying with 0·15% DDT @ 40—60 gallons per acre.
Turmeric	1. White lacewing bug *Stephanitis typicus* Dist.	Do.	Moderate	1. Spraying with 0·1% DDT @ 40—60 gallons per acre. 2. Dusting with 5% BHC @ 15—20 lb. per acre.
	2. Scale insect *Aspidiotus hartii* Ckll.	Orissa	Serious	Spraying with 0·025% parathion @ 40—60 gallons per acre.
	3. Thrips *Panchaetothrips indica* Bagn.	Kerala, Mysore	Moderate	Dusting with 5% BHC @ 15—20 lb. per acre.
	4. Stem borer *Dichocrocis punctiferalis* Guen.	Do.	Moderate	1. Destruction of affected shoots. 2. Spraying with 0·25% DDT @ 40—60 gallons per acre.
	5. Turmeric skipper *Udaspes folus* Cram.	Madras, Maharashtra, Orissa, Punjab.	Serious	1. Picking of caterpillars. 2. Spraying with 0·25% DDT @ 40—60 gallons per acre.
	6. Bihar hairy caterpillar *Diacrisia obliqua* Wlk.	Bihar, West Bengal	Moderate	1. Hand-picking of young larvae before dispersal. 2. Dusting with 10% BHC @ 15—20 lb. per acre. 3. Spraying with 0·25% BHC @ 40—60 gallons per acre.
	7. Leaf beetles *Lema praeusta* Fb. *L. signatipennis* Jac.	Orissa	Serious	Spraying with 0·25% DDT @ 40—60 gallons per acre.
Ginger	1. Ginger borer *Dichocrocis punctiferalis* Guen.	Andhra Pradesh, Gujarat, Kerala, Madras, Maharashtra, Mysore, Orissa.	Moderate	1. Destruction of affected shoots. 2. Spraying with 0·25 % DDT @ 40—60 gallons per acre.
	2. Turmeric skipper *Udaspes folus* Cram.	Do.	Serious	1. Picking of caterpillars. 2. Spraying with 0·25% DDT @ 40—60 gallons per acre.

(1)	(2)	(3)	(4)	(5)
SPICE CROPS—*contd.*				
Cumin and Coriander	1. Flower head bug *Agnoscelis nubila* Fb.	Andhra Pradesh, Gujarat, Kerala, Madras, Maharashtra, Mysore, Orissa.	Moderate	Dusting with 5% DDT @ 15—20 lb. per acre.
	2. Aphid *Hyalopterus arundinis* F.	Do.	Moderate	Spraying with 0·05% Nicotine sulphate @ 40—60 gallons per acre.
	3. Lucerne caterpillar *Laphygma exigua* Hbn.	Do.	Moderate	Dusting with 5% DDT @ 15—20 lb. per acre.
Cardamom	1. Cardamom thrips *Taeniothrips cardamomi* Ramak.	Kerala, Madras, Mysore	Serious	Spraying with 0·025% parathion @ 60—80 gallons per acre.
	2. Leaf eating caterpillar *Eupterote canaraica* M.	Do.	Moderate	Spraying with 0·025% parathion @ 60—80 gallons per acre.
All crops	1. Desert locust *Schistocerca gregaria* Forsk	All over India in plague period	Serious	1. Dusting 5% BHC on hoppers up to 3rd stage @ 20—30 lb. per acre. 2. Dusting 10% BHC on 4th & 5th stage hoppers and adults @ 20—30 lb. per acre. 3. Spraying aldrin on egg beds and adults @ 2 oz. (actual) per acre.
	2. Bombay locust *Patanga succincta* L.	Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Madras, Maharashtra, Uttar Pradesh, West Bengal.	Moderate	Do.
	3. Migratory locust *Locusta migratoria* L.	Gujarat, Kerala, Madras, Mysore, Rajasthan.	Moderate	Do.
STORAGE PESTS				
Rice, Wheat, Barley, Maize, etc.	1. Rice weevil *Sitophilus oryzae* L	All over India	Serious	Fumigating with Methyl bromide @ 16 gm./cu.m. (1 lb./1000 cu. ft.) for 24 hours or ED/CT mixture 400 gm./cu.m. (25 lb./1000 cu. ft.) for 48 hours.

	2. Khapra beetle *Trogoderma granarium* Everts	Northern India	Serious	Fumigating with Methyl bromide @ 24 gm./cu.m. (1½ lb./1000 cu. ft.) for 24 hours or ED/CT mixture at 640 gm./cu.m. (40 lb./1000 cu. ft.) for 48 hours.
	3. Lesser grain borer *Rhizopertha dominica* Fb.	All over India	Serious	Fumigating with Methyl bromide @ 16 gm./cu.m. (1 lb./1000 cu. ft.) for 24 hours or ED/CT mixture 400 gm./cu.m. (25 lb./1000 cu. ft.) for 48 hours.
	4. Rice moth *Corcyra cephalonica* Staint.	Do.	Serious	Do.
	5. Angoumois grain moth *Sitotroga cerealella* Oliv.	Do.	Serious	Do.
Millets	1. Rice weevil *Sitophilus oryzae* L.	All over India	Serious	Fumigating with Methyl bromide @16 gm./cu.m. (1 lb./1000 cu. ft.) for 24 hours or ED/CT mixture 400 gm./ cu. m. (25 lb./ 1000 cu. ft.) for 48 hours.
	2. Lesser grain borer *Rhizopertha dominica* Fb.	Do.	Serious	Do.
Wheat, Rice & Millet flour	1. Rust-red flour beetle *Tribolium castaneum* Hbst.	Do.	Serious	Fumigating with Methyl bromide @ 16 gm./cu.m. for 24 hours.
	2. Angoumois grain moth *Sitotroga cerealella* Oliv.	Do.	Serious	Do.
	3. Long headed flour beetle *Latheticus oryzae* Waterhouse	Do.	Mild	Do.
Wheat flour	Thorictid beetle *Thorictodes heydeni* Reitter	West Bengal	Moderate	Do.
Gram, Bean, Pea, Pulses, etc.	Pulse beetles *Pachymerus chinensis* L. *Bruchus analis* Fb. *Laria affinis* Froel	All over India	Serious	Fumigating with Methyl bromide @ 16 gm./cu. m. (1 lb./1000 cu. ft.) for 24 hours or ED/CT mixture 400 gm./cu. m. (25 lb./1000 cu. ft.) for 48 hours.
Potato	Potato tuber moth *Gnorimoschema operculella* Zell.	Do.	Moderate	1. Dusting seed potatoes with DDT 5% @ 80—100 gm./ quintal (1–2 oz./md.) 2. Fumigating with Methyl bromide @ 16 gm./cum. for 3 hours.

(1)	(2)	(3)	(4)	(5)
STORAGE PESTS—*contd.*				
Cashewnut	1. Almond or fig moth *Ephestia cautella* Wlk.	All over India	Mild	Fumigating with Methyl bromide @ 16 gm./cu. m. for 24 hours.
	2. Rice weevil *Sitophilus oryzae* L.	Do.	Moderate	Do.
	3. Saw-toothed beetle *Oryzaephilus surinamensis* L.	Do.	Mild	Do.
Raisins	1. Saw-toothed beetle *Oryzaephilus surinamensis* L.	Do.	Moderate	Do.
	2. Flat grain beetle *Laemophloeus ferrugineus* (Steph.)	Do.	Mild	Do.
Coconut, Groundnut	1. Dried fruit beetle *Carpophilus dimidiatus* Fb.	Do.	Moderate	Fumigating with Methyl bromide @ 16 gm./cu.m. for 15 hours.
	2. Saw toothed beetle *Oryzaephilus surinamensis* L.	Do.	Serious	Do.
	3. Copra bug or ham beetle *Necrobia rufipes* de Geer	Do.	Serious	Do.
	4. Rust-red flour beetle *Tribolium castaneum* Hbst.	Do.	Serious	Do.
	5. Khapra beetle *Trogoderma granarium* Everts	Do.	Mild	Do.
	6. Rice moth *Corcyra cephalonica* Staint.	Do.	Serious	Do.
	7. Almond or fig moth *Ephestia cautella* Wlk.	Do.	Moderate	Do.
Niger	Almond or fig moth *Ephestia cautella* Wlk.	Andhra Pradesh	Moderate	Fumigating with Methyl bromide @ 16 gm./cu. m. for 15 hours.
Gingelly (*Til*)	Rust-red flour beetle *Tribolium castaneum* Hbst.	All over India	Moderate	Do.

Coriander, Cumin and Turmeric	1. Cigarette beetle *Lasioderma serricorne* Fb.	Do.	Serious	Fumigating with Methyl bromide @ 16 gm./cu.m. for 24 hours or ED/CT mixture @ 400 gm./cu.m. for 48 hours.
	2. Spice beetle *Stegobium paniceum* L.	Do.	Serious	Do.
Pepper & Ginger	1. Spice beetle *Stegobium paniceum* L.	Kerala	Serious	Do.
	2. Cigarette beetle *Lasioderma serricorne* Fb.	Andhra Pradesh, Kerala, Madras, Mysore.	Moderate	Do.
Tamarind	1. Tamarind bruchid *Caryedon gonagra* F.	Andhra Pradesh	Moderate	Removing seeds and mixing salt by pounding and storing as compact cake.
	2. Tamarind seed borer *Sitophilus linearis* Hbst.	All over India	Serious	1. Picking and destroying infested seeds. 2. Fumigating with Methyl bromide @ 16 gm./cu.m. for 15 hours or ED/CT mixture @ 400 gm/cu.m. for 48 hours.
Okra and other vegetable seeds	Bruchid *Spermophagus* sp.	Andhra Pradesh, Assam, Bihar, Delhi.	Serious	1. Mixing with DDT 5% @ 80 gm./quintal. 2. Fumigating with Methyl bromide @ 16 gm./cu.m. for 15 hours.
Tobacco	Cigarette beetle *Lasioderma serricorne* Fb.	All over India	Serious	Fumigating with Methyl bromide @ 16 gm./cu.m. for 24 hours.
Treatment of empty godowns				1. Spraying the surface of the walls with lindane 0·5% or malathion 0·5% @ 0·5 litre/10 sq. m. 2. Fogging the warehouse so as to deposit a film of lindane or malathion @ 275 mg./sq.m. 3. Fumigating with Methyl bromide @ 16 gm./cu.m. for 24 hours or ED/CT @ 400 gm./cu.m. for 36 hours.

(1)	(2)	(3)	(4)	(5)
PESTS OTHER THAN INSECTS AND MITES				
Paddy, vegetables	Snails	Andaman & Nicobar Islands, Andhra Pradesh, Jammu & Kashmir, Orissa, West Bengal.	Mild	1. Collecting and burying deep in the soil. 2. Baiting with Metaldehyde or Paris green using wheat bran as carrier. 3. Spreading common salt in a band around the plot.
Vegetables	1. Slugs	Andhra Pradesh, Assam, Madhya Pradesh, Uttar Pradesh, West Bengal.	Moderate	Do.
	2. Millipedes	Assam, West Bengal	Mild	Dusting with 1% endrin.
Crop fields	Earth-worms	Andhra Pradesh, Himachal Pradesh	Moderate	1. Moisten the soil to a depth of 10 inches with heptachlor 20% @12 c.c. per gallon of water. 2. Mixing ammonium sulphate in the soil.
Paddy	Crabs	Maharashtra	Serious	1. Fumigating burrows with calcium cyanide dust.
		Andhra Pradesh, Madras, Orissa	Mild	2. Baiting with DDT using boiled rice as carrier.
Cereals, vegetables & fruit crops	Birds (Parrots, Crows, Sparrows, Peacocks, Pigeons, etc.)	All over India	Serious	Shooting and scaring by means of mechanical bird scarer.
All crops	Field rats	Do.	Serious	1. Baiting with 0·125% strychnine hydrochloride or 20% barium carbonate or 3% zinc phosphide or 0·025% Warfarin. 2. Fumigating burrows with calcium cyanide dust.
Vegetables	Rabbits	All over India	Moderate	1. Fumigating burrows with calcium cyanide dust. 2. Using traps baited with carrots or cabbage leaves.

Fruit trees	Squirrels	Do.	Moderate	Baiting with 3% zinc phosphide.
Potato and other crops	Porcupines	All over India except in hilly areas at high altitudes.	Moderate	1. Fumigating burrows with calcium cyanide dust. 2. Baiting with 3% zinc phosphide using raw potatoes as carrier.
Guava, mango, loquat, apple, pear, banana, coconut, sapota, *jamun*, arecanut, cashewnut and fruits.	Flying Foxes	All over India	Moderate	Shooting and exploding roosting places during the day.
Fruits, vegetables and coconut.	Monkeys	Do.	Serious	1. Shooting 2. Trapping
Sugarcane, melon, cucumber and pineapple.	Jackals	All States except Himachal Pradesh	Serious	Baiting with strychnine hydrochloride in meat.
Potato, sweet-potato, sugarcane and root crops.	Wild Boars	All States with forests and vast thick grass lands.	Serious	Shooting
Cereal crops and Sugarcane	1. Blue Bulls	Do.	Moderate	Shooting
	2 Elephants	Assam, Bihar, Kerala, Mysore, Tripura, Uttar Pradesh.	Moderate	Fencing and scaring by shooting.
	3. Deer & Antelopes	Andhra Pradesh, Gujarat, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh.	Serious	Shooting
	4. Wild Cattle	Madhya Pradesh, Punjab, Uttar Pradesh.	Moderate	Catching and taming.
Fruits, vegetables	Bear	Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Manipur, Mysore, Punjab.	Moderate	Shooting
Watermut	Tortoise	Delhi, Punjab, Uttar Pradesh	Moderate	Netting

Crop	Disease and Causal Organism	Distribution	Economic Status	Control Measures
(1)	(2)	(3)	(4)	(5)
CEREALS				
Paddy	1. Foot rot and seedling blight *Fusarium moniliforme* Sheldon	Andhra Pradesh, Assam, Bihar, Himachal Pradesh, Madhya Pradesh, Madras, Mysore, Orissa, Tripura, Uttar Pradesh, West Bengal.	Serious	1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight. 2. Destruction of stubbles of infected crop.
	2. Sesame leaf spot or Brown spot *Helminthosporium oryzae* Breda de Haan	All over India	Serious	1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight. 2. Spraying nurseries with Bordeaux mixture 4:4:50 or 0.3% of any other copper fungicide (50% copper) @60—80 gallons per acre. 3. Use of resistant varieties. 4. Burning of straw and stubbles of diseased crop.
	3. Blast *Piricularia oryzae* Cav.	Do.	Serious	Do.
	4. Bunt *Neovossia horrida* (Takah.) Padwick & Khan	Assam, Bihar, Madras, Maharashtra, Orissa, Uttar Pradesh, West Bengal.	Mild	—
	5. Leaf smut *Entyloma oryzae* Syd.	Bihar, Madhya Pradesh, Maharashtra, Orissa, Punjab, Uttar Pradesh, West Bengal.	Mild	—
	6. Stem rot *Sclerotium oryzae* Catt.	All over India	Mild	1. Marking out areas containing diseased plants before harvesting and their eradication.

				2. Draining away the water and allowing the soil to bake before irrigating again. 3. Use of resistant varieties.
	7. Udbatta *Balansia oryzae* (Syd.) Narasimhan and Thirum.	Andhra Pradesh, Bihar, Jammu & Kashmir, Mysore, Orissa.	Mild	—
	8. Narrow brown leaf spot *Cercospora oryzae* Miyake	All over India	Mild	—
	9. Stackburn *Trichoconis padwickii* Ganguly	Kerala, Madras, Orissa, Uttar Pradesh, West Bengal.	Mild	—
	10. False smut *Ustilaginoidea virens* (Cke.) Takah.	All over India	Mild	—
Wheat	1. (i) Black rust *Puccinia graminis tritici* Pers.	Do.	Serious	1. Use of resistant varieties. 2. Protecting the crop (at least the seed crop) by dusting with fine sulphur @ 10—12 lb. per acre.
	(ii) Brown rust *Puccinia triticina* Eriks.	Do.	Moderate	Do.
	(iii) Yellow rust *Puccinia glumarum* (Schm.) Eriks. & Henn.	Do.	Moderate	Do.
	2. Loose smut *Ustilago tritici* (Pers.) Rostr.	All over India	Moderate	1. Seed treatment by solar heat method. 2. Roguing of affected ear heads. 3. Use of resistant varieties.
	3. Yellowing rot *Corynebacterium tritici* (Hutch.) Bergey et al & Earcockle *Anguillulina tritici* (Steinb.)	Delhi, Punjab, Rajasthan, Uttar Pradesh.	Moderate	1. Removal of galls from seeds by flotation method. 2. Eradication of affected ear heads.
	4. Foot rot *Helminthosporium sativum* Pam., King & Bakke	Bihar, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, West Bengal.	Mild	Seed treatment with an organomercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight.
	5. Bunts *Tilletia caries* (DC.) Tul. and *T. foetida* (Wallr.) Liro	Above 3,000 ft. in Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh.	Moderate	Do.

(1)	(2)	(3)	(4)	(5)
CEREALS–*contd.*				
Wheat—*contd.*	6. Karnal bunt *Neovossia indica* (Mitra) Mundkur	Delhi, Punjab, Uttar Pradesh	Moderate	—
	7. Flag smut *Urocystis tritici* Koern.	Delhi, Punjab, Rajasthan, Uttar Pradesh.		1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight. 2. Use of resistant varieties.
Barley	1. (*i*) Black rust *Puccinia graminis tritici* Pers.	All over India	Serious	Same as under wheat.
	(*ii*) Yellow rust *Puccinia glumarum* (Schm.) Eriks. & Henn.	Do.	Serious	Do.
	2. Covered smut *Ustilago hordei* (Pers.) Lagerh.	Do.	Serious	1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight. 2. Roguing of smutted heads.
	3. Loose smut *Ustilago nuda* (Jens.) Rostr.	Do.	Moderate	1. Seed treatment by solar heat method. 2. Roguing of affected ear-heads.
	4. Stripe disease *Helminthosporium gramineum* Rabenh.	Bihar, Maharashtra, Rajasthan, Uttar Pradesh, West Bengal.	Serious	Seed treatment with an organo-mercurial compound (1 % active material) @ 1 part of chemical dust per 400 parts of seed by weight.
	5. Foot rot & seedling blight *Helminthosporium sativum* Pam., King & Bakke & *H. teres* Sacc.	Bihar, Punjab, Uttar Pradesh	Mild	Do.

Oats	1. Black rust *Puccinia graminis avenae* Eriks. & P. Henn.	All over India	Serious	—
	2. Covered smut *Ustilago kolleri* Wille	Do.	Serious	1. Seed treatment with an organo-mercurial compound (1 % active material) @ 1 part of chemical dust per 400 parts of seed by weight. 2. Roguing of affected earheads.
	3. Loose smut *Ustilago avenae* (Pers.) Rostr.	Do.	Mild	Do.
Jowar	1. Grain smut *Sphacelotheca sorghi* (Lk.) Clint.	Do.	Serious	Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight or sulphur dust @ 1 part per 250 parts of seed by weight.
	2. Loose smut *Sphacelotheca cruenta* (Kuehn) Potter.	Do.	Serious	Do.
	3. Head smut *Sphacelotheca reiliana* (Kuehn) Clint.	Andhra Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore.	Mild	1. Destruction of smutted ears. 2. Crop rotation.
	4. Long smut *Tolyposporium ehrenbergii* (Kuehn) Pat.	Do.	Mild	—
	5. Downy mildew *Sclersopora sorghi* (Kulk.) Weston & Uppal	Do.	Serious	—
	6. Rust *Puccinia purpurea* Cooke	Do.	Mild	Use of resistant varieties.
Italian Millet	Smut *Ustilago crameri* Korn.	Andhra Pradesh, Madhya Pradesh, Madras, Maharashtra, Mysore.	Serious	1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight or sulphur dust @ 1 part per 250 parts of seed by weight. 2. Destruction of smutted ears.

(1)	(2)	(3)	(4)	(5)
CEREALS–*contd.*				
Ragi	1. Leaf blight and foot rot *Helminthosporium nodulosum* Berk. and Curt.	All over India	Moderate	Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight.
	2. Blast *Piricularia oryzae* Cav.	Andhra Pradesh, Madras, Mysore	Mild	Use of resistant varieties.
Maize	1. Leaf blight *Helminthosporium turcicum* Pass.	All over India	Moderate	Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 400 parts of seed by weight.
	2. Downy mildew *Sclerospora philippinensis* Weston and *S. sorghi* (Kulk.) Weston and Uppal	Do.	Serious	Spraying with 5:5:50 Bordeaux mixture or 0.3% of any other copper fungicide (50% copper) @ 60—80 gallons per acre.
	3. Smut *Ustilago maydis* (DC.) Cda.	In hill districts of West Bengal, Jammu & Kashmir.	Mild	—
Bajra	1. Green-ear disease *Sclerospora graminicola* (Sacc.) Schroet.	All over India	Serious	—
	2. Smut *Tolyposporium penicillariae* Bref.	Do.	Moderate	—
	3. Ergot *Claviceps microcephala* (Wallr.) Tul.	Gujarat, Maharashtra, Mysore, Rajasthan.	Moderate	1. Obtaining seeds from disease-free areas. 2. Removing floating sclerotia of ergot by putting contaminated seeds in 20% salt solution in water and destroying these by burning.
PULSES				
Black & Green Gram	1. Leaf spot *Cercospora cruenta* Sacc. & *C. dolichi* Ellis and Everh.	Assam, Bihar, Jammu & Kashmir, Madhya Pradesh, Madras, Maharashtra, Uttar Pradesh.	Moderate	Spraying with Bordeaux mixture 4:4:50 or 0·3% of any other copper fungicide (50% copper) @ 60—80 gallons per acre.
Gram	1. Wilt *Fusarium orthoceras* Appel and Wollenw.	All over India	Serious	1. Delayed sowing (by middle of October). 2. Eradication of affected plants. 3. Crop rotation.

	2. Wilt (Physiological)	Punjab.	Serious	1. Conservation of soil moisture and loosening of sub-soil up to a depth of about 1 foot during monsoon. 2. Delayed sowing, beginning about the 2nd week of October and continued up to about the middle of the last week. 3. Avoidance of broadcast method of sowing. 4. Irrigation during the early stage of growth of the crop.
	3. Rust *Uromyces ciceris-arietini* (Greg.) Jacz. and Boyer	Bihar, Delhi, Maharashtra, Punjab, Uttar Pradesh, West Bengal.	Mild	—
	4. Blight *Mycosphaerella rabiei* Kovachevski	Jammu & Kashmir, Punjab	Serious	1. Removal of diseased plants and their destruction by burning. 2. Use of healthy seed for planting. 3. Use of resistant varieties.
Pigeon pea	1. Wilt *Fusarium udum* Butler	All over India	Serious	1. Roguing of diseased plants. 2. Mixed cropping with *jowar*. 3. Use of resistant varieties. 4. Long rotation with non-susceptible crops.
Pea	1. Powdery mildew *Erysiphe polygoni* DC.	Do.	Serious	Dusting the crop with fine sulphur @ 10—12 lb. per acre.
	2. Downy mildew *Peronospora viciae* (Berk) Casp.	Do.	Mild	Spraying the crop with Bordeaux mixture 4:4:50 or 0·3 % of any other copper fungicide (50% copper) @ 60—80 gallons per acre.
	3. Rust *Uromyces fabae* (Pers.) de Bary	Do.	Mild	Dusting with fine sulphur @ 10—12 lb. per acre.
SUGARCANE	1. Red rot *Physalospora tucumanensis* (Went) speg.	Do.	Serious	1. Use of healthy setts for planting. 2. Avoidance of ratooning of diseased crop.

(1)	(2)	(3)	(4)	(5)
Sugarcane—*contd.*				
				3. Roguing and destruction of affected shoots and clumps. 4. Use of resistant varieties.
	2. Smut *Ustilago scitaminea* Syd.	All over India	Serious	Do.
	3. Wilt *Cephalosporium sacchari* Butler	Bihar, Maharashtra, Punjab, Uttar Pradesh.	Mild	1. Eradication of diseased clumps. 2. Rotation of crops, avoiding replanting of sugarcane in affected fields for three years. 3. Saving the crop from damage by termites and other soil pests.
	4. Rust *Puccinia kuehnii* (Krueg.) Butler	Andhra Pradesh, Madras, Maharashtra, Uttar Pradesh.	Moderate	4. Use of resistant varieties. Use of resistant varieties.
	5. Mosaic (Virus)	All over India	Mild	1. Use of resistant varieties. 2. Sett selection.
	6. Pineapple rot or Sett rot *Ceratostomella paradoxa* (de Seynes) Dade	Madras	Moderate	Dipping setts in solution of an organo-mercurial salt (Aretan 0·1% or Agallol 0·5%).
	7. Grassy shoot (Virus)	Andhra Pradesh, Bihar, Madras, Maharashtra, Uttar Pradesh.	Moderate	1. Destruction of affected plants. 2. Obtaining seeds from disease-free areas.
FIBRE CROPS				
Cotton	1. Wilt *Fusarium vasinfectum* Atk.	All over India	Serious	Use of resistant varieties.
	2. Root rot *Macrophomina phaseoli* (Maubl.) Ashby and *Corticium solani* (Prill and Delacr.) Bourd. and Glaz.	Do.	Moderate	1. Eearly or late sowing. 2. Mixed cropping with *moth* (*Phaseolus aconitifolius*) or *jowar*. 3. Use of resistant varieties.
	3. Anthracnose *Colletotrichum indicum* Dastur	Andhra Pradesh, Bihar, Madhya Pradesh, Madras, West Bengal.	Serious	1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 350 parts of seed by weight. 2. Crop rotation. 3. Destruction of plant debris.

	4. Black-arm *Xanthomonas malvacearum* (E.F. Sm.) Dow.	Gujarat, Kerala, Madras, Mysore	Serious	1. Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 350 parts of seed by weight. 2. Removal and destruction of volunteer plants and plant debris.
	5. Sore skin or Dry rot *Rhizoctonia bataticola* (Taub.) Butler *R. solani* Kuehn	Andhra Pradesh, Maharashtra	Mild	1. Sowing either disease-free seeds or seeds treated with an organo-mercurial fungicide (1% active material) @ 1 part of chemical dust per 350 parts of seed by weight. 2. Early sowing should be avoided.
	6. Grey mildew *Ramularia areola* Atk.	Maharashtra	Serious	Dusting with fine sulphur @ 10—14 lb. per acre.
	7. Alternaria leaf spot *Alternaria macrospora* Zimm.	Do.	Moderate	—
	8. Small leaf (virus) or Stenosis	Madras, Maharashtra	Mild	Use of resistant varieties.
Jute	Stem rot *Macrophomina phaseoli* (Maubl.) Ashby	Assam, Orissa, Tripura, West Bengal	Serious	Seed treatment with an organo-mercurial compound (1% active material) @ 1 part of chemical dust per 320 parts of seed by weight.
Rosella hemp 'Mesta'	Stem rot *Sclerotinia sclerotiorum* (Lib.) de Bary	Bihar, Uttar Pradesh, West Bengal	Mild	Hand-picking the sclerotia from infected seeds prior to sowing.
OIL SEEDS Castor	1. Rust *Melampsorella ricini* (Biv.) de Toni	Andhra Pradesh, Madras, Maharashtra.	Serious	Dusting with fine sulphur @ 12—15 lb. per acre.
	2. Seedling blight *Phytophthora colocasiae* Racib.	All over India	Mild	Spraying with Bordeaux mixture or other copper fungicide.
	3. Alternaria blight *Alternaria ricini* (Yoshii) Hansford	Madhya Pradesh, Maharashtra, Uttar Pradesh.	Moderate	Treating seeds with organo-mercuric fungicides.

(1)	(2)	(3)	(4)	(5)
OIL SEEDS–*contd.*				
Mustard & *Duan* (*Eruca sativa*)	1. Pod blight *Alternaria brassicae* (Berk.) Sacc.	All over India	Moderate	Spraying with Bordeaux mixture 4:4:50 or 0·3% of any other copper fungicide (50 % copper) @ 100–150 gallons per acre.
	2. Downy mildew *Peronospora parasitica* (Fr.) Tul.	Do.	Moderate	Do.
	3. White rust *Cystopus candidus* (Pers.) de Bary	Do.	Moderate	
	4. Root rot *Sclerotinia sclerotiorum* (Lib.) de Bary	Bihar, Punjab, Uttar Pradesh, West Bengal.	Moderate	—
Linseed	1. Rust *Melampsora lini* (Pers.) Lev.	All over India	Serious	Use of resistant varieties.
	2. Wilt *Fusarium lini* Bolley	Do.	Moderate	Do.
Gingelly (*Til*)	1. Phyllody (virus)	Andhra Pradesh, Delhi, Gujarat, Madras, Uttar Pradesh.	Serious	—
	2. Leaf spot or blight *Cercospora sesami* Zimm.	Assam	Serious	1. Destruction of plant debris. 2. Immersing the seeds in hot water (128°F.) for 30 minutes.
Groundnut	1. 'Tikka' disease *Cercospora personata* (B. & C.) Ellis and Everh. and *C. arachidicola* Hori	All over India	Serious	Two or three rounds of spraying with Bordeaux mixture 2: 2:50 or 0·1% of copper oxychloride @ 40—60 gallons per acre or dusting with sulphur @ 10 lb. per acre.
	2. Clump or Rosette (virus)	Do.	Serious	1. Roguing and destruction of affected plants. 2. Use of resistant varieties.

FRUITS				
Citrus	1. Canker *Xanthomonas citri* (Hasse) Dowson	Do.	Serious	Pruning of affected parts and spraying with Bordeaux mixture 5: 5: 50 or 0·3% of any other copper fungicide (50% copper) @ 1—2 gallons per tree.
	2. Wither tip *Colletotrichum gloeosporioides* (Penzig) Sacc.	Do.	Serious	Do.
	3. Leaf fall and fruit rot *Phytophthora palmivora* Butler	Andhra Pradesh, Madras, Mysore	Serious	Do.
	4. Gummosis *Phytophthora* spp.	Andhra Pradesh, Assam, Gujarat, Madhya Pradesh, Madras, Maharashtra.	Serious	Removal of the gum pockets and application of Bordeaux paste.
	5. Pink disease *Pellicularia salmonicolor* (B. and Br.) Dastur	Do.	Mild	Pruning of affected parts and application of Bordeaux paste to cuts and wounds and to the forks of the branches.
	6. Powdery mildew *Oidium tingitanium* Carter	Andhra Pradesh Kerala, Madras, Mysore.	Moderate	Dusting with fine sulphur @½—1 lb. per tree.
	7. Foliocellosis (Zinc deficiency)	All over India	Moderate	Spraying with zinc sulphate-lime mixture (10 lb. zinc sulphate, 5 lb. lime and 100 gallons of water with a spreader) @ 1—2 gallons per tree.
	8. Scab *Elsinoe fawceti* Bitanc. & Jenkins	Assam, Uttar Pradesh	Mild	Spraying with Bordeaux mixture 5:5:50 or 0·3% of any other copper fungicide @ 1—2 gallons per tree.
	9. Die back and decline Tristeza disease or quick decline Virus	Maharashtra	Not yet fully determined	—
Mango	1. Powdery mildew *Oidium mangiferae* Berthet.	Andhra Pradesh Gujarat, Kerala, Madhya Pradesh, Madras Mysore.	Serious	Dusting with fine sulphur @ 1—3 lb. per tree.

(1)	(2)	(3)	(4)	(5)
FRUITS—*contd.*				
Mango—*contd.*	2. Anthracnose *Colletotrichum gloeosporioides* (Penzig) Sacc.	Assam, Kerala, Madras, Punjab Uttar Pradesh.	Moderate	Removal of the affected parts and spraying the trees with Bordeaux mixture 3:3:50 or 0·3% of any other copper fungicide (50% copper) @ 2–5 gallons per grafted tree and 5–10 gallons per seedling tree.
	3. Black tip (Physiological)	Bihar, Uttar Pradesh	Serious	Spraying plants in fruiting stage 3 or 4 times with a solution of 6 lb. borax in 100 gallons of water.
Grapevine	1. Powdery mildew *Uncinula necator* (Schw.) Burr.	Andhra Pradesh, Madras, Maharashtra, Mysore.	Serious	Dusting with fine sulphur @ 30–40 lb. per acre or spraying with wettable sulphur (1 lb. in 80 gallons of water) or Barium polysulphide (0·5%) @ 150-200 gallons per acre.
	2. Downy mildew *Plasmopara viticola* Berl. and de Toni	Do.	Serious	Spraying with Bordeaux mixture 4: 4: 50 or 0·3% of any other copper fungicide (50% copper) @ 150–200 gallons per acre.
	3. Anthracnose *Gloeosporium ampelophagum* (Pass.) Sacc.	Andhra Pradesh, Madras, Maharashtra, Mysore.	Moderate	Do.
Banana	1. Panama wilt *Fusarium oxysporum* var. *cubense* (E.F. Smith) Wollenw. and Reinking	Andhra Pradesh Assam, Bhar, Kerala, Madhya Pradesh, Madras, West Bengal.	Moderate	1. Eradication of affected plants and application of sulphur or lime to the soil in the pits. 2. Use of planting material from disease-free areas. 3. Use of resistant varieties. 4. Flooding of the ground with 2′ of water to kill the fungus.

	2. Mosaic or Chlorosis (Virus)	Gujarat, Maharashtra	Mild	Eradication of affected plants.
	3. Bunchy top (Virus)	Assam, Kerala, Orissa, Madras, West Bengal.	Moderate	Do.
	4. Anthracnose *Gloeosporium musarum* Cooke & Masse	All over India	Moderate	Spraying Bordeaux mixture 5: 5: 50 or 0·3% of any other copper fungicide (50% copper) @ 150—200 gallons per acre.
	5. Sigatoka *Mycosphaerella musicola* Leach	Assam, Madras	Serious	Spraying Borodeaux mixture 5:5:50 or 0·3% of any other copper fungicide (50% copper) @ 150–200 gallons per acre.
Fig	Rust *Cerotelium fici* (Cast.) Arth.	Madras, Marahashtra, Mysore	Mild	Dusting with fine sulphur @ ½—1 lb. per tree.
Guava	1. Zinc deficiency	Rajasthan	Mild	Spraying zinc sulphate-lime mixture (zinc sulphate 1 lb., hydrated lime 0·7 lb. and water 16 gallons) @ 1–2 gallons per tree.
	2. Wilt *Fusarium oxysporum* var. *psidii* Prasad, Mehta & Lal	Uttar Pradesh, West Bengal	Serious	—
	3. Anthracnose *Colletotrichum psidii* Curzi	All over India	Moderate	1. Removal and destruction of the mummies. 2. Spraying with Bordeaux mixture (1%) or Lime sulphur (1 : 25), at intervals of 15 days, @ 1—2 gallons per tree.
	4. Scab *Pestalotiopsis psidii* (Pat.) Venkatkrishniah	Maharashtra, Mysore, Uttar Pradesh.	Serious	—
Pineapple	1. Soft rot *Ceratostomella paradoxa* (de Seynes) Dade	Andhra Pradesh, Assam, Madras, Kerala, Uttar Pradesh, West Bengal.	Serious	1. Use of healthy and disease-free suckers for planting. 2. Clean cultivation and destruction of diseased material by burning.

(1)	(2)	(3)	(4)	(5)
FRUITS—*contd.*				
Pineapple—*contd.*	2. Heart or stem rot *Phytophthora parasitica* Dastur	Assam	Mild	1. Thorough drainage of soil. 2. Use of vigorous planting material. 3. Dipping the planting materials in concentrated Bordeaux mixture (1:1:3) before planting.
Papaya	1. Stem rot *Pythium aphanidermatum* (Edson) Fitz.	All over India	Serious	1. Avoidance of water logging. 2. Removal and burning of badly affected plants. 3. Application of Bordeaux paste or spraying stems with Bordeaux mixture 6:6:50 @ ½ gallon per tree.
	2. Mosaic	Assam, Bihar, Delhi, Madhya Pradesh, Maharashtra.	Serious	—
Apple	1. Scab *Venturia inaeqalis* (Cooke) Wint.	Jammu & Kashmir, Punjab	Serious	Spraying lime sulphur (1:30 dilution) or Captan @ 1–2 gallons per tree.
	2. Stem black *Coniothecium chomatosporum* Corda	Uttar Pradesh, Himachal Pradesh	Serious	Removal and destruction of diseased branches and application of Chaubattia paste* or Bordeaux paste to cut surfaces and other affected areas.
	3. Stem brown *Botryosphaeria ribis* Gross Duggar	Do.	Serious	Pruning and destruction of the affected parts and application of Chaubattia paste or Bordeaux paste to cut surfaces and other affected areas.
	4. Pink disease *Pellicularia salmonicolor* (B. and Br.) Dastur	Uttar Pradesh	Serious	1. Painting the forks of the branches before the onset of the monsoon with Chaubattia or Bordeaux paste.

*Chaubattia paste consists of 4 parts of copper carbonate, 4 parts of red lead and 3 parts of lanoline.

				2. Excision of diseased material at least 2 feet before the last site of invasion and burning it.
	5. Mildew *Podosphaera leucotricha* (Ellis and Everh.) Salm.	Himachal Pradesh, Jammu & Kashmir, Mysore, Punjab, Uttar Pradesh.	Mild	Dusting with fine sulphur @ ½–1 lb. per tree or spraying with wettable sulphur (1 lb. in 80 gallons of water) @ 1–2 gallons per tree.
	6. Collar rot *Rosselina* sp.	Uttar Pradesh	Serious	—
	7. Sooty blotch and Fly speck *Leptothyrium pomi* (Mont. & Fr.) Sacc.	Himachal Pradesh, Jammu and Kashmir, Punjab, Uttar Pradesh.	Moderate	1. Spraying trees (in fruiting state) with lime sulphur or colloidal sulphur (1:30 dilution) @–12 gallons per tree. 2. Fruits intended for storage should be washed with 5% solution of bleaching powder or 3% sodium chlorate.
	8. Leaf spot *Phyllosticta pirina* Sacc.	Punjab, Uttar Pradesh, West Bengal	Serious	1. Collecting and destroying during winter the fallen leaves of the apple plants. 2. Spraying with Bordeaux mixture either at dormant (3:10:40) or open cluster or petalfall stage (2:10:40) @ 1–2 gallons per tree.
	9. Bitter rot *Gloeosporium fructigenum* Berk.	Assam, Uttar Pradesh	Moderate	Spraying with Bordeaux mixture 3:10:40 @ 1–2 gallons per tree.
	10. Brown rot *Sclerotinia fructigena* Aderh. Rukl.	Punjab	Serious	1. Collecting and destroying affected fruits. 2. Pruning of infected spurs and cankered branches during summer.
Peach	1. Leaf curl *Taphrina deformans* (Berk.) Tul	Himachal Pradesh, Jammu and Kashmir, Punjab, Uttar Pradesh.	Moderate	Spraying Bordeaux mixture 4:4:50 or 0·3% of any other copper fungicide (50% copper) @ 1–2 gallons per tree.

(1)	(2)	(3)	(4)	(5)
FRUITS—*contd.*				
Peach—*contd.*	2. Sun scald (Physiological)	Uttar Pradesh	Serious	Tying grass round main stem and branches.
	3. Collar or Root rot *Rosselina* sp.	Do.	Serious	—
Apricot	1. Collar or Root rot *Rosselina* sp.	Do.	Moderate	—
	2. Pink disease *Corticium salmonicolor* (B. and Br.) Dastur	Do.	Serious	1. Painting the forks of the branches before the onset of the monsoon with Chaubattia or Bordeaux paste. 2. Excision of diseased material at least 2 feet before the last site of invasion and burning it.
	3. Sun scald (Physiological)	Do.	Serious	Tying grass round main stem and branches.
Pear	1. Stem black *Coniothecium chomatosporum* Corda	Uttar Pradesh, Himachal Pradesh	Serious	Removal and destruction of diseased branches and application of Chaubattia paste or Bordeaux paste to cut surfaces and other affected areas.
	2. Pink disease *Pellicularia Salmonicolor* (B. and Br.) Dastur	Uttar Pradesh	Serious	1. Painting the forks of the branches before the onset of the monsoon with Chaubattia or Bordeaux paste. 2. Excision of diseased material at least 2 feet before the last site of invasion and burning it.
	3. Sun scald (Physiological)	Do.	Serious	Tying grass round main stem and branches.
	4. Brown rot *Sclerotinia fructigena* Aderh. and Rukl.	Punjab	Serious	1. Collecting and destroying affected fruits. 2. Pruning of infected spurs and cankered branches during summer.

Cashewnut	Die back *Pellicularia salmonicolor* (B. and Br.) Dastur	Kerala	Mild	Pruning of affected branches and their destruction by burning and application of tar or Bordeaux paste to the cut ends.
Ber	Powdery mildew *Oidiopsis* sp.	Uttar Pradesh	Moderate	Dusting with fine sulphur @ ½–1 lb. per tree.
Jack fruit	Fruit rot *Rhizopus artocarpi* Racib.	All over India	Moderate	Spraying the young fruits with Bordeaux mixture 2:2:50 at intervals of 3 weeks @ 5—10 gallons per tree.
Plum	1. Collar or Root rot *Rosselina* sp.	Uttar Pradesh	Moderate	—
	2. Sun scald (Physiological)	Do.	Serious	Tying grass round main stem and branches.
Cherry	Sun scald (Physiological)	Do.	Serious	Do.
Chestnut	Blight *Endothia parasitica* (Murr.) And. & And.	Do.	Mild	—
Strawberry	1. Leaf blight *Dendrophoma obscurans* (E. & E.) H. W. Anderson	Do.	Moderate	Spraying with 0·2% Zineb or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	2. Leaf scorch *Marssonina fragariae* (Sacc.) Kleb *Diplocarpon earliana* (Ellis & Everh.) Wolf.	Do.	Serious	Spraying with 0·2% Zineb or 0·3% of any other copper fungicide(50% copper) @ 40—60 gallons per acre.
VEGETABLES				
Potato	1. Early blight *Alternaria solani* (Ell. and Mart.) Jones & Grout	Assam, Bihar, Himachal Pradesh, Madras, Mysore, Punjab, Tripura, Uttar Pradesh, West Bengal.	Serious	Spraying the crop with 0·2% Zineb or Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	2. Late blight *Phytophthora infestans* (Mont.) de Bary	Do.	Serious	Do.

(1)	(2)	(3)	(4)	(5)
VEGETABLES—*contd.*				
Potato—*contd.*				
	3. Charcoal rot *Botryodiplodia phaseoli* (Maubl.) Thirum.	Bihar	Moderate	1. Early harvesting of the crop when the weather is comparatively cool. 2. Use of resistant varieties.
	4. Black scurf *Rhizoctonia solani* Kuehn	Orissa, Punjab	Moderate	1. Selection of disease-free tubers for planting. 2. Treatment of the tubers with formalin (1 : 120) or mercuric chloride (1 : 1000) solution before planting.
	5. Ozonium wilt *Ozonium texanum* var. *parasiticum* Thirum.	Bihar, Himachal Pradesh, Uttar Pradesh.	Moderate	Disinfection of the soil with 1 : 1000 mercuric chloride solution before planting.
	6. Dry rot *Fusarium caeruleum* (Lib.) Sacc.	All over India	Moderate	Disinfection of the godowns, container (baskets, etc.) and the tubers with 1 : 120 formalin solution before storage.
	7. Bacterial wilt *Pseudomonas solanacearum* (Smith) Dowson	Assam, Bihar, Madras, Maharashtra, Mysore, Punjab, Uttar Pradesh, West Bengal.	Serious	1. Use of disease-free potato tubers as seed. 2. Disinfection of the cutting implements. 3. Treating the soil with 400 lb. sulphur dust per acre.
	8. Virus diseases	All over India	Severe	Use of disease-free seeds.
	9. Common scab *Actinomyces scabies* (Thax.) Gussow	Andhra Pradesh, Assam, Himachal Pradesh, Madras, Uttar Pradesh.	Mild	1. Green manuring. 2. Applying 300—600 lb. sulphur dust per acre.
	10. Wart *Synchytrium endobioticum* (Schilb.) Perc.	West Bengal	Serious	Using resistant varieties.

Cruciferous vegetables	1. Damping off *Pythium* spp., *Phytophthora* spp., and *Sclerotium rolfsii* (Sacc.) Curzi	All over India	Mild	1. Drenching the soil in seed beds with formalin (1 : 50) at 1 gallon for 2 or 3 sq. ft. of soil a few weeks before planting the seed or pre-sowing soil treatment with formaldehyde dust. 2. Spraying the seedlings with 2 : 2 : 50 Bordeaux mixture, a week after their germination.
	2. Downy mildew *Peronospora parasitica* (Fr.) Tul.	Do.	Mild	Spraying with Bordeaux mixture 3 : 3 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	3. Blight *Alternaria brassicae* (Berk.) Sacc.	Do.	Mild	Spraying with Bordeaux mixture 5 : 5 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	4. White rust *Cystopus candidus* (Pers.) de Bary	Do.	Mild	1. Spraying with Bordeaux mixture 5 : 5: 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre. 2. Removal and destruction of weed hosts.
	5. Black rot *Xanthomonas campestris* (Cobb) Dowson	Assam, Maharashtra, West Bengal	Moderate	Seed treatment with mercuric chloride (1 : 1000) solution for 15 minutes.
	6. Club root *Plasmodiophora brassicae* Woron	Madras, Mysore	Moderate	1. Liming the soil to bring it to neutral or alkaline state. 2. Drenching planting poles with 1 : 1500 mercuric chloride solution.

(1)	(2)	(3)	(4)	(5)
VEGETABLES—				
contd. Cucurbits	1. Powdery mildew *Erysiphe cichoracearum* DC.	All over India	Serious	Dusting the crop with fine sulphur @ 10—12 lb. per acre or spraying with Barium polysulphide (0·5%) @ 40—60 gallons per acre.
	2. Downy mildew *Pseudoperonospora cubensis* (Berk. & Curt.) Rost.	Do.	Mild	Spraying the crop with Bordeaux mixture 3 : 3 : 50 or 0·3% of any other copper fungicide (50 % copper) @ 40—60 gallons per acre.
	3. Fruit rots *Pythium aphanidermatum* (Eds.) Fits. and *Colletotrichum lagenarium* (Pass.) Ell. & Halst.	Do.	Serious	Do.
Tomato	1. Damping off *Pythium* spp., *Phytophthora* spp., and *Rhizoctonia* spp.	All over India	Mild	1. Seed treatment with organic or organo-mercurical compounds. 2. Pre-sowing soil treatment with formaldehyde dust (1 lb. formaldehyde to 5⅛ lb. of an inert dust). 3. Spraying of seed beds with Cheshunt compound.
	2. Virus diseases	Do.	Serious	1. Roguing of the affected plants in the early stage. 2. Spraying or dusting the crop with insecticides for the control of insect vectors.
Brinjal	1. Virus disease (Little leaf)	Andhra Pradesh, Madras	Mild	Eradication of infected plants.
	2. Leaf spots *Alternaria solani* (Ell. & Mart.) Sorsensu Jones and Grout, *Cercospora solani* Sacc., *Phyllosticta* sp., etc.	All over India	Mild	Spraying the crop with Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 60—80 gallons per acre.

	3. Wilt *Fusarium oxysporum* Schlecht. *Fusarium lycopersici* (Sacc.) Snyder and Hansen	Do.	Mild	Eradication of infected plants.
Lady's finger	1 Yellow vein mosaic (Virus)	Do.	Serious	1. Eradication of *Hibiscus tetraphyllu* weed. 2. Spraying the crop with fish-oil rosin soap or other insecticides for the control of insect vectors. 3. Use of disease tolerant varieties.
	2. Leaf spots *Cercospora hibisci* Tracy and Earle, *Alternaria* sp. etc.	Do.	Mild	Spraying the crop with Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 60—80 gallons per acre.
	3. Damping off *Pythium* spp. *Rhizoctonia* spp.	Do.	Mild	1. Seed treatment with organic or organo-mercurial compounds. 2. Pre-sowing soil treatment with formaldehyde dust, (1 lb. formaldehyde to 5$\frac{1}{2}$ lb. of an inert dust). 3. Spraying of seed beds with Cheshunt compound.
Beans	1. Powdery mildew *Erysiphe polygoni* DC.	Do.	Mild	Dusting the crop with fine sulphur @ 10—12 lb. per acre.
	2. Anthracnose *Colletotrichum lindemuthianum* (Sacc. & Magn.) Bri. et. Cav.	Do.	Mild	Planting of healthy seed.
	3. Rust *Uromyces appendiculatus* (Pers.) Lev.	Do.	Mild	Dusting with fine sulphur @ 10—12 lb. per acre, if the disease appears in a serious form.
Cluster beans	1. Powdery mildew *Leveillula taurica* (Lev.) Arn.	Do.	Mild	Dusting the crop with fine sulphur @ 10—12 lb. per acre.

(1)	(2)	(3)	(4)	(5)
VEGETABLES—*contd.*				
Colocasia	Leaf spot *Phytophthora colocasiae* Racib.	All over India	Mild	Spraying with Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
Onion	1. Leaf blight *Alternaria palandui* Ayyangar	Andhra Pradesh, Madras, Mysore	Moderate	Spraying with Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 30—50 gallons per acre.
	2. Smut *Urocystis cepulae* Frost	Mysore (highly localised)	Serious	1. Removal and destruction of infected plants. 2. Long crop rotation; onion or garlic should not be planted in affected fields for at least 10 years.
PLANTATION CROPS				
Coffee	1. Rust *Hemileia vastatrix* Berk. and Br.	Kerala, Madras, Mysore	Serious	Spraying the crop with Bordeaux mixture 2 : 2 : 50 or 0·3% of any other copper fungicide (50% copper) @ 2–3 gallons per tree.
	2. Black rot *Corticium koleroga* (Cooke) Hohnel	Do.	Moderate	Do.
	3. Die back *Colletotrichum coffeanum* Noack	Do.	Moderate	Do.
	4. Nursery Collar rot or Damping-off *Rhizoctonia* sp. and *Fusarium* sp.	Do.	Serious	1. Collection and burning of all infected seedlings. 2. Drench-spraying of Bordeaux mixture 2 : 2 : 50 to cover the seedlings and to soak the soil to a depth of 4—6". The operation to be repeated every fourth day.

	5. Stump-rot or brown root *Fomes noxius* Corner	Kerala, Madras, Mysore	Serious	Removal of infected bushes and collection and burning of all diseased material.
Tea	1. Blister blight *Exobasidium vexans* Massee	Assam, Kerala, Madras, Mysore, West Bengal.	Serious	Spraying with Boardeaux mixture 5 : 5 : 50 or 0·3% of any other copper fungicide (50% copper) @ 60—80 gallon per acre.
	2. Red rust *Cephaleuros parasiticus* Karsten	Do.	Moderate	Spraying with Bordeaux mixture (1%) or 0·3% of any other copper fungicide (50 % coppe @ 60—80 gallons per acre.)
	3. Brown blight *Colletotrichum camelliae* Massee	Do.	Moderate	Do.
	4. Grey blight *Pestalozzia theae* Sawada	Do.	Moderate	Do.
	5. Brown root rot *Fomes lamaoensis* (Murr.) Sacc. and Trott.	Do.	Serious	Removal of infected bushes and collection and burning of all diseased material.
	6. Charcoal stump-rot *Ustulina zonata* (Lev.) Sacc.	Do.	Serious	Eradication of the affected bushes.
	7. Red root rot *Sphaerostilbe repens* Berk. and Br.	Do.	Serious	Do.
Rubber	1. Leaf blight *Phytophthora palmivora* Butler	Kerala	Serious	Spraying with Bordeaux mixture (1%) or 0·3% of any other copper fungicide (50% copper) @ 3—4 gallons per tree.
	2. Powdery mildew *Oidium heveae* Steinm.	Do.	Serious	Dusting with fine sulphur @ 2–3 lb. per tree.
	3. Mouldy rot *Ceratostonella fimbriata* Ellio	Do	Moderate	Painting of the recently tapped bark with a wettable organo-mercurial compound (3% mercury, at a dilution of 1 oz. in 2½ gallons water).

(1)	(2)	(3)	(4)	(5)
PLANTATION CROPS—*contd.*				
Areca nut	1. Fruit rot *Phytophthora palmivora* Butler	Assam, Kerala, Maharashtra, Mysore	Serious	Spraying with Bordeaux mixture 5 : 5: 50 or 0·3% of any other copper fungicide (50% copper) @ 1—1½ gallons per tree.
	2. Foot rot *Ganoderma lucidum* (Leyss. Ex. Fr.) Karst.	Assam, Kerala, Madras, Mysore, West Bengal.	Moderate	1. Application of sulphur dust to the base of the tree. 2. Removal of the dead trunks of palms and their disposal by burning.
	3. Stem bleeding *Ceratostomella paradoxa* Dade.	Madras, Mysore	Serious	Scraping off the affected tissues and painting the exposed area with hot tar or Bordeaux paste.
	4. Stem breaking (Physiological due to sun-scald).	Mysore	Mild	Protecting from sun the stem facing south-western side by tying areca leaf sheaths.
Coconut	1. Nut fall and bud rot *Phytophthora palmivora* Butler	Andhra Pradesh, Assam, Kerala, Madras, Maharashtra, Mysore, Orissa, West Bengal.	Moderate	Spraying with Bordeaux mixture 5 : 5 : 50 or 0·3% of any other copper fungicide (50% copper) @ 1–2 gallons per tree.
	2. Leaf rot *Helminthosporium halodes* Drechsler *Colletotrichum paucisetum* Petch and *Gliocladium roseum* Bain.	Kerala	Serious	Spraying the crown and leaves with 1% Bordeaux mixture or 0·3% of any other copper fungicide (50% copper) @ 1—2 gallons per tree.
	3 Stem bleeding *Ceratostomella paradoxa* Dade	Andhra Pradesh, Assam, Kerala, Madras.	Mild	Scraping off the affected tissues and painting the exposed area with hot tar or Bordeaux paste.
	4. Foot rot *Ganoderma lucidum* (Leyss. Ex. Fr.) Karst.	Do.	Mild	1. Application of sulphur dust to the base of the tree. 2. Removal of the dead trunks of palms and their disposal by burning.

DRUGS AND NARCOTICS				
Tobacco	1. Damping off *Pythium aphanidermatum* (Edson) Fitz. and *Phytophthora* sp.	All over India	Serious	1. Soil sterilization. 2. Spraying nursery beds and the seedlings with Bordeaux mixture 2:2:50 or 0·3% of any other copper fungicide (50% copper) @ 20—30 gallons per acre.
	2. Leaf spot *Cercospora nicotianae* Ellis and Everh.	Do.	Moderate	Spraying with Bordeaux mixture (1%) or 0·3% of any other copper fungicide (50% copper) @ 60—80 gallons per acre.
	3. Black shank *Phytophthora parasitica* Dastur var. *Nicotianae* Tuck.	Andhra Pradesh, Kerala, Madras	Mild	1. Spraying with Bordeaux mixture (1%) or 0·3% of any other copper fungicide (50% copper) @ 60—80 gallons per acre. 2. Destroying refuse of plants by burning.
	4. Virus diseases	Do.	Serious	Eradication of affected plants.
	5. Anthracnose *Colletotrichum tabacum* Boning	Andhra Pradesh	Moderate	Spraying Bordeaux mixture 2:2:50 or 0·3% of any other copper fungicide (50% copper) or 0·2% Zineb @ 60—80 gallons per acre.
	6. Powdery mildew *Erysiphe cichoracearum* var. *nicotianae* Comes.	Andhra Pradesh, Mysore	Serious	Application of 40 lb. of dusting sulphur per acre to the soil between the rows of plants (mixed with sand or ash 3 to 4 times).
Opium Poppy	Downy mildew *Peronospora gaumannii* Mundkur.	Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh.	Moderate	Spraying with Bordeaux mixture (1%).
FOODER CROPS				
Lucerne	1. Powdery mildew *Levelillula taurica* (Lev.) Arn.	All over India	Serious	Dusting with fine sulphur @ 10—12 lb. per acre.

(1)	(2)	(3)	(4)	(5)
FODDER CROPS—*contd.*				
Lucerne—*contd.*	2. Downy mildew *Peronospora trifoliorum* de Bary	All over India	Moderate	Spraying with Bordeaux mixture 3 : 3 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	3. Rust *Uromyces striatus* Schrot.	Do.	Mild	In severe attacks, the crop can be dusted with fine sulphur @ 10—12 per acre.
Berseem	Root rot *Pellicularia filamentosa* (Pat.) Rogers	Bihar, Uttar Pradesh	Mild	—
SPICE CROPS				
Turmeric	1. Leaf spot *Colletotrichum capsici* (Syd.) Butler & Bisby	Andhra Pradesh, Hyderabad, Madhya Pradesh, Madras, Maharashtra, Mysore, West Bengal.	Moderate	Spraying the crop with Bordeaux mixture (1%) or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	2. Leaf blotch *Taphrina maculans* Butler	Assam, Bihar, Maharashtra, Uttar Pradesh, West Bengal.	Moderate	Spraying the crop with Bordeaux mixture 4 : 4 : 50 or 0·3 % of any other copper fungicide (50% copper)@ 40—60 gallons per acre.
Betelvine	Foot rot *Phytophthora parasitica* Dastur	All over India	Serious	Spraying the vines and the soil round the base of the plants with Bordeaux mixture 2 : 2 : 50 or 0·3% of any other copper fungicide (50% copper) @ 80—100 gallons per acre.
Ginger	Rhizome rot *Pythium* spp.	Andhra Pradesh, Assam, Kerela, Madras, Mysore, West Bengal.	Moderate	1. Treatment of the rhizomes with mercuric chloride (1:1000) before storage.

				2. Spraying the soil and seedlings with Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
Cumin	1. Powdery mildew *Erysiphe polygoni* DC.	Gujarat, Madhya Pradesh, Maharashtra, Rajasthan.	Serious	Dusting with fine sulphur @ 10—12 lb per acre.
	2. Wilt *Fusarium oxysporum cumini* Prasad & Patel	Gujarat, Rajasthan	Serious	—
Coriander	1. Powdery mildew *Erysiphe polygoni* DC.	Gujarat, Madhya Pradesh, Maharashtra, Rajasthan.	Mild	Dusting with fine sulphur @ 10—12 lb. per acre.
	2. Tumour *Protomyces macrosporus* Unger	Assam, Bihar, Madhya Pradesh, Punjab, Uttar Pradesh, West Bengal.	Moderate	Obtaining seeds from disease-free localities.
Cardamom	Marble disease (Virus)	Kerala, Madras, Maharashtra, Mysore.	Serious	1. Eradication of affected plants. 2. Planting of healthy seedlings raised under disease-free conditions. 3. Prohibition of the importation of rhizomes and living plant material from diseased to healthy localities.
Large Cardamom	Foorki disease (Virus)	West Bengal	Serious	Do.
Chilli	1. Fruit rot & Die back *Colletotrichum capsici* (Syd.) Butler & Bisby	All over India	Serious	Spraying with Bordeaux mixture 4 : 4 : 50 or 0·3% of any other copper fungicide (50% copper) @ 40—60 gallons per acre.
	2. Powdery mildew *Oidiopsis taurica* (Lev.) Salm.	Mysore	Serious	Dusting with fine sulphur @ 10—12 lb. per acre.

APPENDIX I

Quantities of Pesticides in various formulations required for different concentrations of spray solutions

(For 100 gallons of Spray solution)

Formulation of Pesticides	Percentage of spray solution required															
	0·01	0·02	0·025	0·03	0·05	0·06	0·08	0·10	0·15	0·16	0·20	0·25	0·30	0·32	0·50	1·00
	Quantity of formulation required in lb.															
10% ..	1·00	2·00	2·50	3·00	5·00	6·00	8·00	10·00	15.00	16·00	20·00	25·00	30·00	32·00	50·00	100·00
20% ..	0·50	1·00	1·25	1·50	2·50	3·00	4·00	5·00	7·50	8·00	10·00	12·50	15·00	16·00	25·00	50·00
25% ..	0·40	0·80	1·00	1·20	2·00	2·40	3·20	4·00	6·00	6·40	8·00	10·00	12·00	12·80	20·00	40·00
30% ..	0·33	0·66	0·83	1·00	1·66	2·00	2·66	3·33	5·00	5·33	6·66	8·33	10·00	10·66	16·66	33·00
40% ..	0·25	0·50	0·62	0·75	1·25	1·50	2·00	2·50	3·75	4·00	5·00	6·25	7·50	8·00	12·50	25·00
50% ..	0·20	0·40	0·50	0·60	1·00	1·20	1·60	2·00	3·00	3·20	4·00	5·00	6·00	6·40	10·00	20·00

no tapioca

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NOTE—1. Storage pests are listed on pages 36–39.

2. Pests other than Insects and Mites are listed on pages 40–41.

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